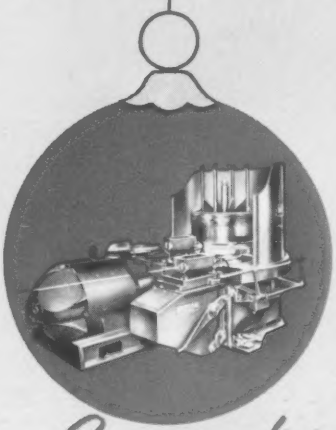
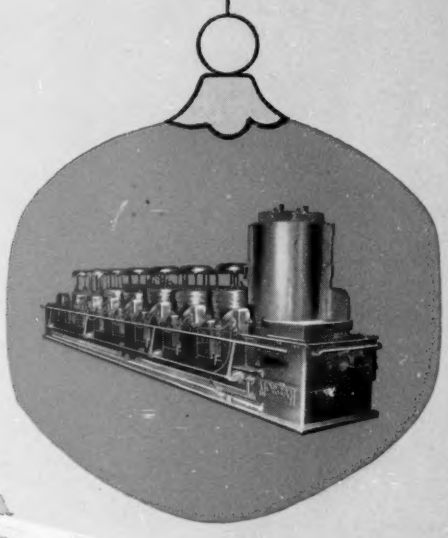
WIRE AND WIRE PRODUCTS

DECEMBER 1961

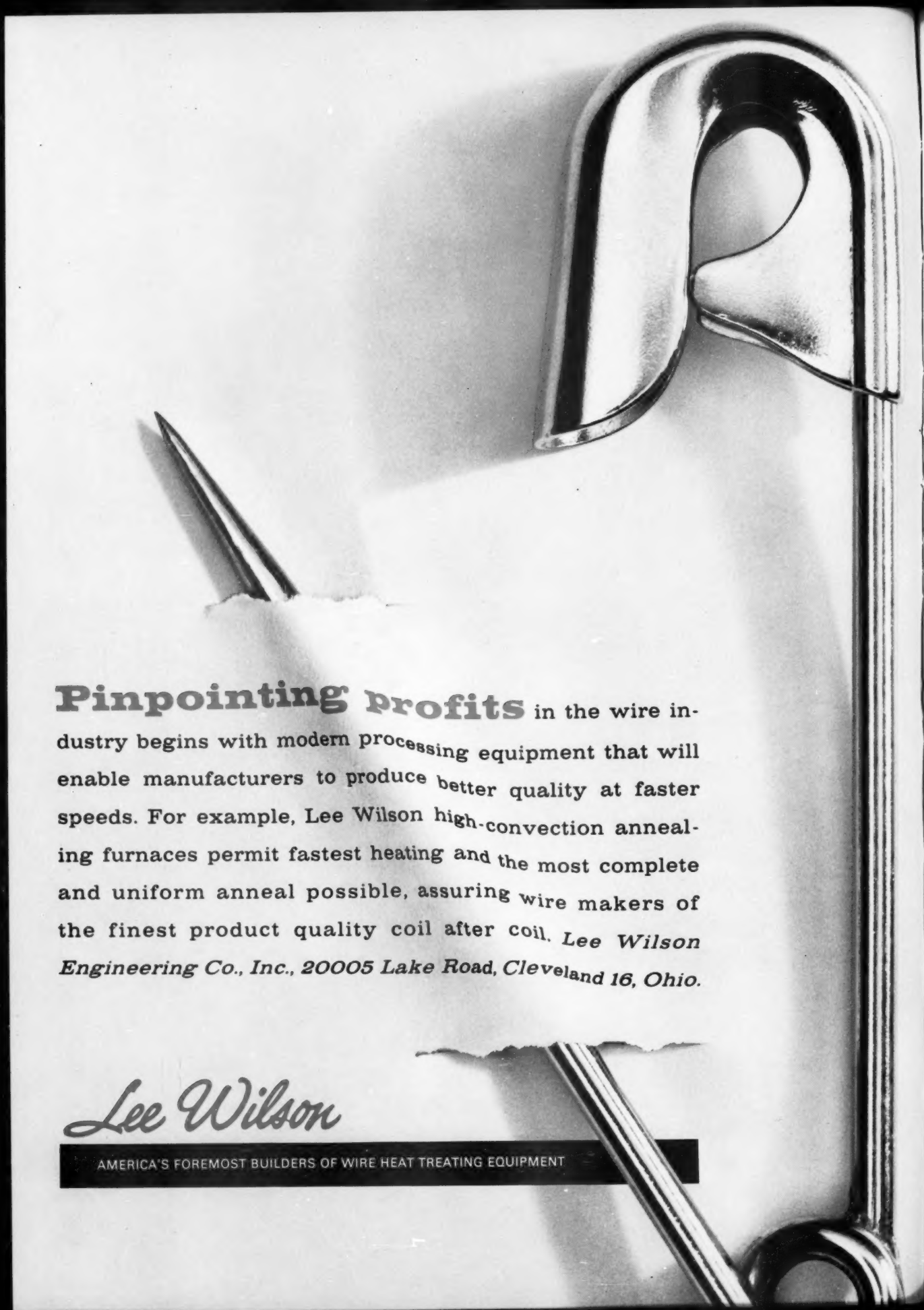




Season's Greetings

MORGAN CONSTRUCTION CO. WORCESTER MASSACHUSETTS

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION



Pinpointing profits in the wire industry begins with modern processing equipment that will enable manufacturers to produce better quality at faster speeds. For example, Lee Wilson high-convection annealing furnaces permit fastest heating and the most complete and uniform anneal possible, assuring wire makers of the finest product quality coil after coil. *Lee Wilson Engineering Co., Inc., 20005 Lake Road, Cleveland 16, Ohio.*

Lee Wilson

AMERICA'S FOREMOST BUILDERS OF WIRE HEAT TREATING EQUIPMENT

Greetings of The Season

At this Season of the Year, when hearts are lighter and the warmth of brotherly love is universal, we of Standard Industrial wish our many, many friends, customers and customers-to-be, the Merriest of Christmases and a most Prosperous New Year.

It is with a great deal of satisfaction that the Year of 1961 can be reviewed—it has brought us all new friends and successes, yet in spite of some trials, tribulations and, yes, even failures—we can still smile and rejoice.

Our best regards to the most wonderful group of men in the world—you wire men! Thank you for your many kindnesses and your unfailing courtesy to us.

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

Sincerely,

Standard Industrial COMPOUNDS CO., INC.

Member WAS

FRANKFORT, ILLINOIS

(Chicago area)

Telephones: 2131 - 2141

European Manufacturer:

Revalorizacion de Grasa y Acietes, S.A.
Gran Via No. 4, Bilboa, Spain.

Canadian Manufacturer:

H. L. Blachford Ltd., 977 Aqueduct St., Montreal, Que.
H. L. Blachford Ltd., 40 Titan Rd., Toronto, Ont.

how TEAMWORK PIONEERED the use of COLOR in PLASTIC JACKET CABLES
LENZ
THE BLANE CORPORATION
CANTON, MASSACHUSETTS
HOW TEAMWORK PRODUCES QUALITY PRODUCTS FOR WIRE & CABLE USERS
THE BLANE CORPORATION
CANTON, MASSACHUSETTS
HOW TEAMWORK RESULTED IN 5 BIG BENEFITS FOR WIRE AND CABLE USERS
Carol
THE BLANE CORPORATION
CANTON, MASSACHUSETTS
HOW TEAMWORK INTRODUCED A NEW SHAPE IN VINYL COLOR CONCENTRATES
THE BLANE CORPORATION
CANTON, MASSACHUSETTS
THIS IS INDUSTRY TEAMWORK IN ACTION!
PRECISION BUSINESS MACHINE
Hook-up Wire
THE BLANE CORPORATION
CANTON, MASSACHUSETTS

These are some of the companies that have teamed with BLANE in its research and development program.

This is teamwork that has proven to be progressive, practical, and profitable to all.

In 1961 our Research and Development staff is working on many important insulation projects. In conjunction with this expanding program, we are offering our services and facilities to all wire and cable manufacturers in a combined effort to solve current and long term insulation problems.

Teaming up with BLANE can be profitable for you, too. We extend an invitation to contact The Blane Man. He will be pleased to be of service.

THE BLANE CORPORATION
CANTON, MASSACHUSETTS

Blane

DAVIS ELECTRIC CO. EXPANDS

DAVIS ELECTRIC COMPANY is pleased to announce the purchase of the assets and exclusive rights to manufacture and service all ENJACO equipment.

The DAVIS ELECTRIC COMPANY has served the Electric Wire and Cable Industry for over 35 years and now is in the outstanding position of being able to supply the industry with a complete line of auxiliary equipment for plastics or rubber for your present extruder or any new installations.

Individual items are available as follows:

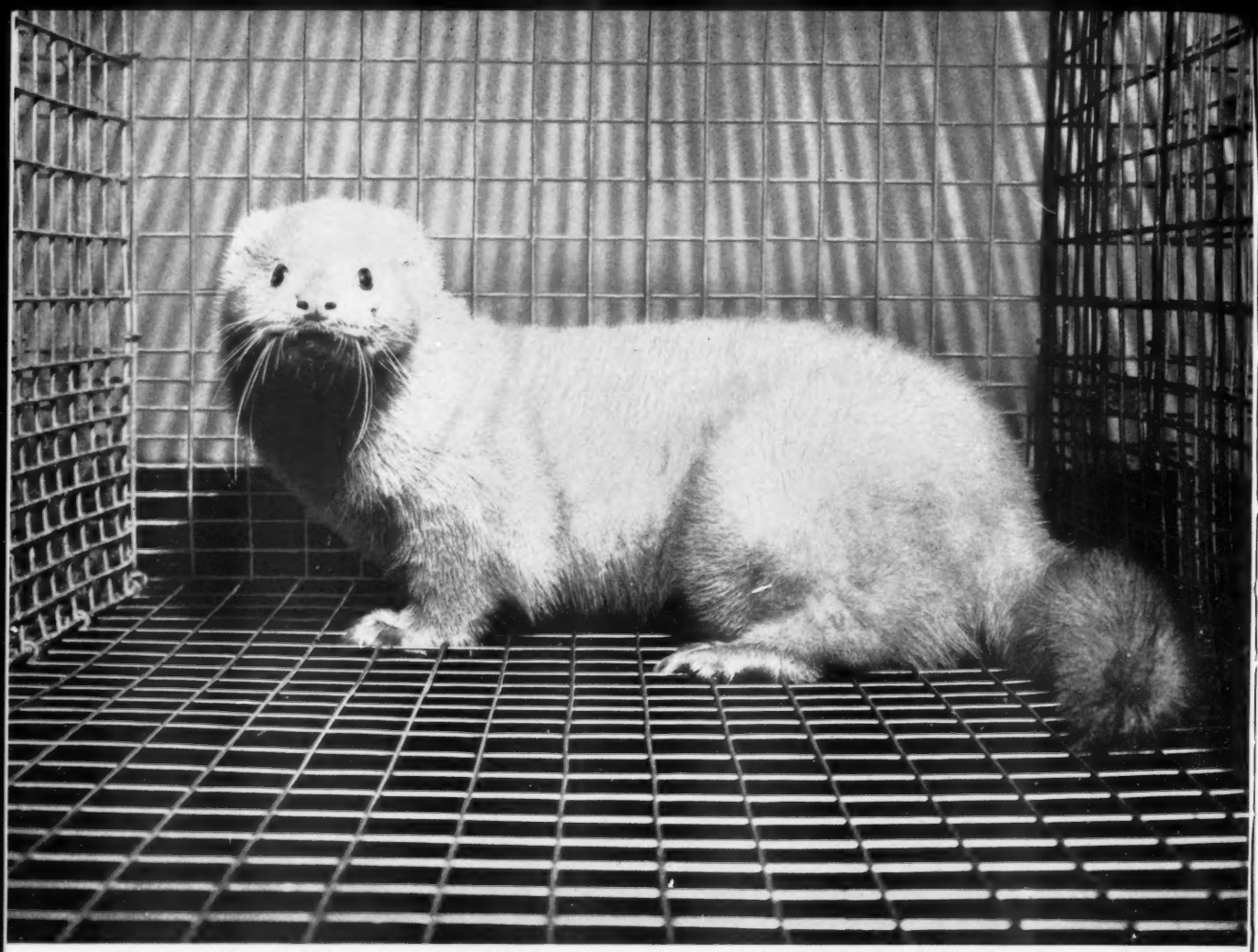
- SPIRAL STRIPING EQUIPMENT
- COMPLETE RAM-TYPE TEFLON-EXTRUDER
- SPARK TESTERS — AC AND DC
- PAY-OFF EQUIPMENT
- TAKE-UPS — SINGLE AND DUAL
- WIRE PRE-HEATERS
- HI-POTENTIAL TESTERS
- CONTROL SYSTEMS
- SPOOLING MACHINES
- MEASURING MACHINES
- COILERS
- TRAVERSES
- CAPSTANS

Your inquiries are invited

THE DAVIS ELECTRIC COMPANY

WALLINGFORD, CONNECTICUT

Telephone: CO 9-3359



A full-length coat of light-colored mutation mink requires about 65 pelts, and may carry a price tag as high as $10,000. Individual pelts may be worth as much as $100.

Bethanized steel wire protects her $100 coat

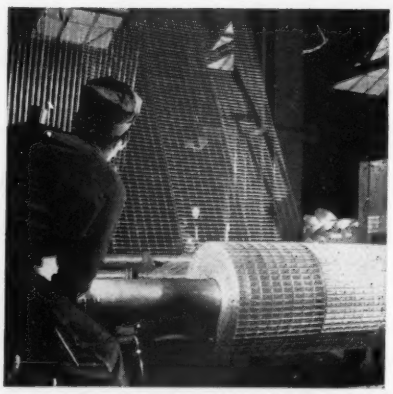
Several years ago, Victor Peternel, a mink rancher in Meadowlands, Pa., was troubled by a costly problem. Rust stains from wire cages downgraded the valuable pelts of his light-color minks, often cutting their sale price in half. Also, he replaced the pens constantly, because ordinary galvanized wire didn't resist the abrasive action of the animals' feet and the harsh corrosion caused by their body acid.

Mr. Peternel, who makes mink cages for his own use and supplies mink wire to other ranchers, consulted with a manufacturer of welded steel wire fabric. They decided to try Bethlehem's bethanized wire, with an extra heavy, C coating of 99.9 per cent pure zinc. After several years the trial cages showed not one spot of rust.

Bethanizing Gives Heavier Coating Weights Than Hot-Dip Galvanizing

Bethanizing, our electrolytic zinc-coating process, makes possible a wide range of coating weights. Including the C coating, four standard weights are available: A; B, twice the A coating; the C coating, three times A; and D, four times the A weight.

Bethanizing also assures complete uniformity, tight bond, high ductility, and ability to withstand severe forming. For more information, get in touch with the nearest Bethlehem office. Or write to us in Bethlehem, Pa.



Here, in one of our customers' plants, is where Bethlehem's bethanized (C coating) wire is made into welded-fabric. It is spooled in 100-ft rolls for such applications as mink cages and chicken pens.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Sales:* Bethlehem Steel Export Corporation

Steel *for Strength ... Economy ... Versatility*

BETHLEHEM STEEL

BETHLEHEM STEEL

WIRE AND WIRE PRODUCTS*

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 36 December, 1961 No. 12

Designated as Official Publication By The Wire Association

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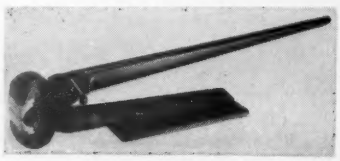
NEW

CAREW BENCH CUTTER



Bolt to Bench or Machine

One Hand Use

Doesn't tie up vise or other expensive makeshift

It can't get lost when bolted to bench

Same replaceable tool steel jaws as our regular cutters

STOCKED BY MOST MILL SUPPLY DEALERS

made by

M. W. ROBINSON CO., INC.

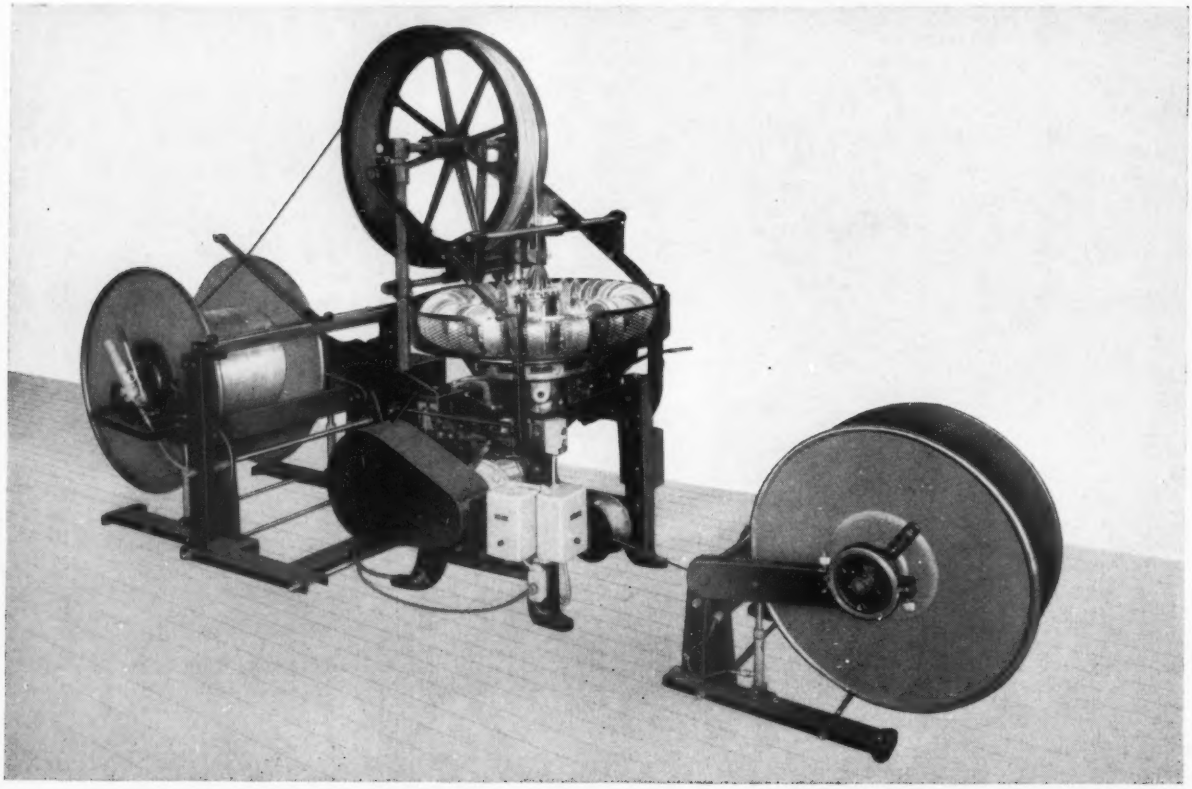
ROCKFALL, CONN., U.S.A.

Please feel free to consult us with your wire cutting problems.

New Improved WARDWELLIAN®

MULTIPLE-END ARMOR WIRE SERVER

Applies multiple ends of wire to electrical conductors – for underground distribution cable and other applications



- For production of underground distribution cable, using multiple ends of flat wire, .009 x .047.
- Equipped with individual tensioning device for each supply package, thus assuring a uniform product.
- Electric stop-motion operates upon breakage or exhaustion of wire at each supply package.
- Machine will accommodate eighteen ten-pound packages of .009 x .047 wire, or other multiples when specified on order.
- Speed of head: 150 RPM.
- Capstan 36" diameter, 6" face.
- Machine driven by 2 HP motor, voltage as specified on order. Standard set of twelve change-gears furnished with each machine.
- New design pay off stand and windup stand as illustrated for accommodating reels from 30" to 48" in diameter. Maximum weight of full reel 5000 pounds.
- Reels raised and lowered hydraulically on both pay off stand and windup stands.
- Pay off stand equipped with adjustable friction-control for desired tension delivery.
- Windup stand equipped with adjustable traverse mechanism.
- Windup stand operated by individual motor through fluid-drive to insure constant rate of draft.
- Machine can be adapted for applying textile coverings with yarn, glass, and various types of synthetics. Copper wire and wires of similar nature can also be applied to other conductors.
- **Pay off stand and windup stand can be furnished separately or in pairs for use with other types of equipment.**

Complete information available on request

WARDWELL Braiding Machine Co.

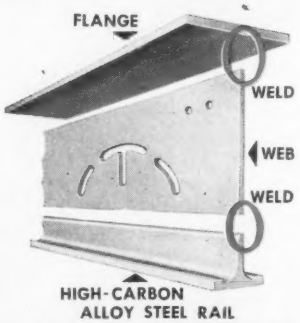
1212 HIGH STREET
CENTRAL FALLS
RHODE ISLAND, U. S. A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

TARCA TRACK

TARCA TRACK TRADE MARK

Introducing a *Superior* OVERHEAD TRACK for *WIRE AND ROD HANDLING*



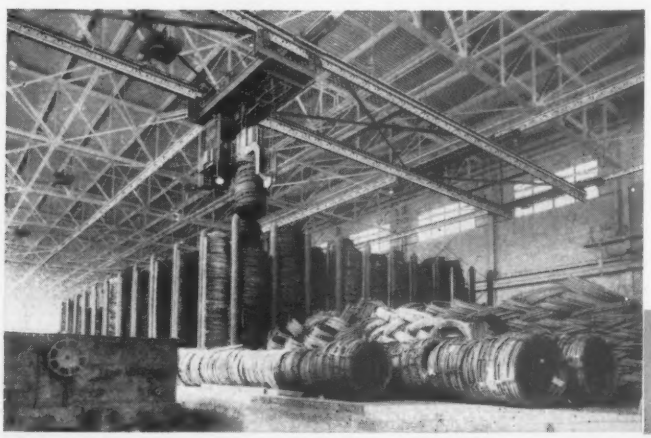
Here's an entirely new track that will withstand heavy, swinging, and impact loads — provide a smooth trouble-free overhead road for materials movement — assure extra years of service over ordinary tracks.

Tarca Track was perfected by Cleveland Tramrail after extensive research and testing. It is different from all other overhead tracks.

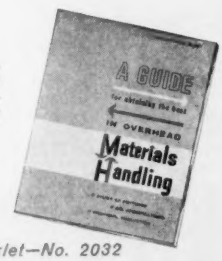
Tarca Track parts are proportioned to provide a perfectly balanced design to suit all load requirements. They are combined into one rugged section by automatically controlled welding. All welds are continuous to assure maximum rigidity.

Erection is easier, faster because Tarca Tracks are straight and accurate. Need of shimming and other time-consuming work is eliminated. New support fittings speed erection and facilitate track alignment.

Integrally Welded TARCA TRACKS are composed of a specially-rolled high-carbon steel rail with raised wearing treads, and a steel flange and web, welded into an integral one-piece section. Wide range of sizes, for loads from 500 lbs. to 20 tons.



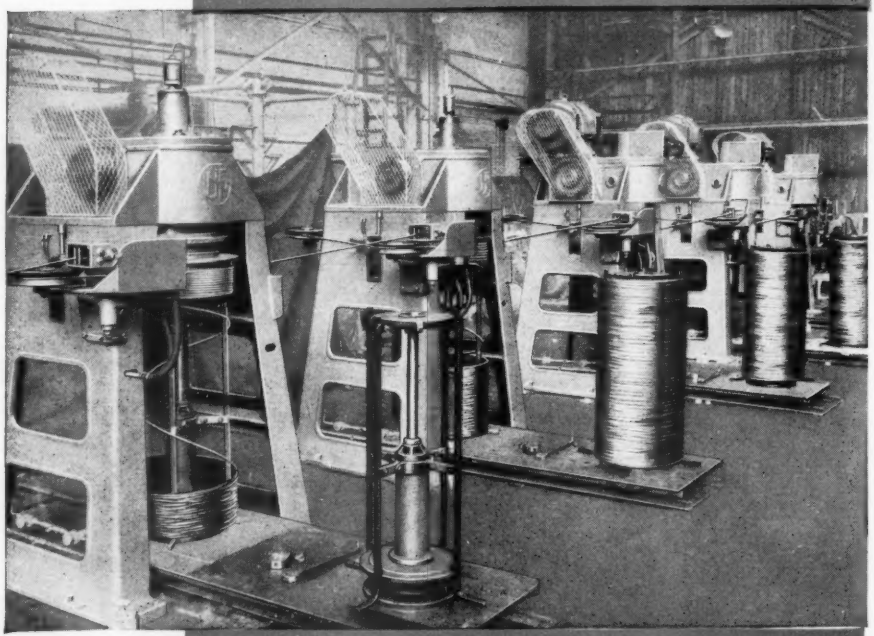
Cleveland Tramrail hydraulically-operated grab stores coils in vertical piles to great heights. Picks up several coils at a time. Works in either vertical or horizontal positions.



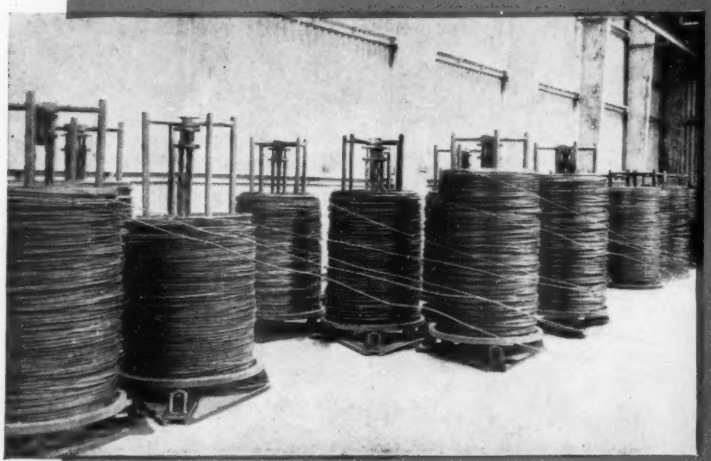
Ask for this Helpful Booklet—No. 2032

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9232 EAST 288 STREET · WICKLIFFE, OHIO

Farmer Norton Gravity blocks for handling large coil weights. These can be built for coils up to 2,000 lb or larger. The units can either draw or wind as required. Can be fitted with constant or variable speed motors. DO NOT TWIST THE WIRE. This is essential for Carbon Steel wire. Are built in block sizes from 36" to 12" diameter.



Five Double Draft Gravity blocks drawing 15 cwt coils of mild steel wire 5.4 mm to 3.7 mm or Single Draft 5.4 mm to 4.4 mm. Drawing speeds 600 ft/min and 800 ft./min. All five of these blocks are operated by one man.

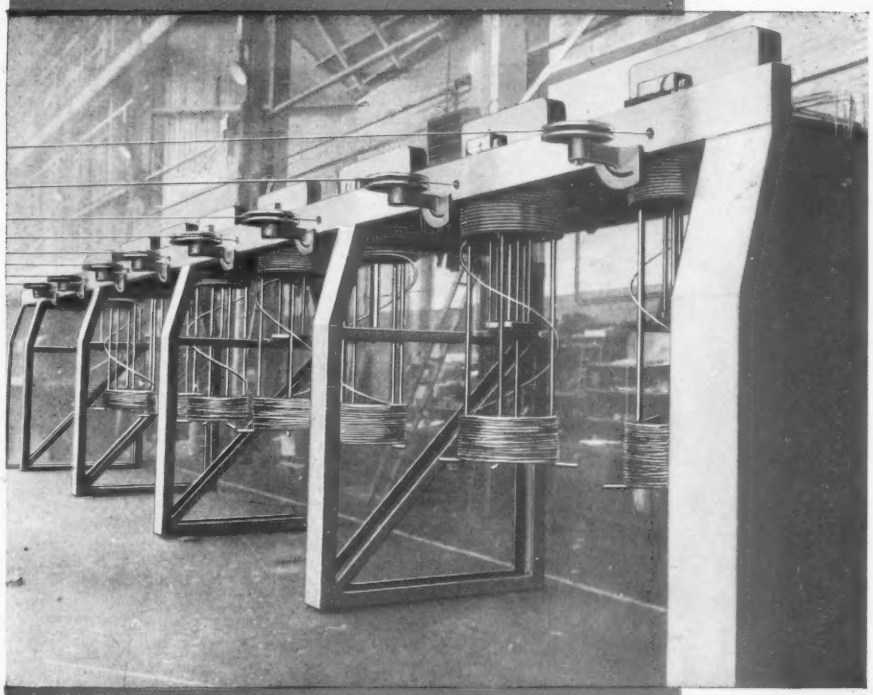


Large coils of this type drawn on Gravity blocks are ideal for feeding cutting machines, nail machines, patenting and galvanising furnaces etc.

SIR JAMES FARMER NORTON & CO. LTD.,

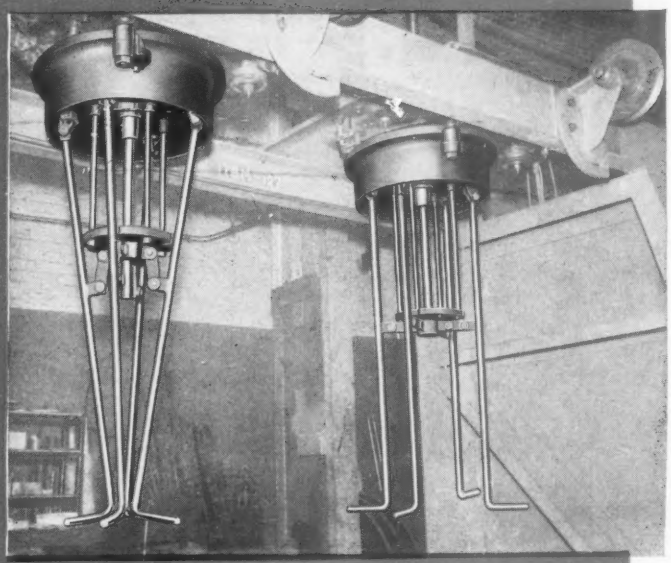
ADELPHI IRONWORKS, ADELPHI STREET, SALFORD 3, ENGLAND. Telephone BLAckfriars 3613/4/5

Agent: Steel & Wire Machinery Inc., 15457 Euclid Avenue, Cleveland 12, Ohio, U.S.A.



Eight head machine for collecting Galvanised wire 5mm - 1.6 mm. in 1,000 lb coils. Drive through variable speed oil gear to give winding speeds of 0 - 150 ft/min. For larger coils up to 2,000 lb a different design of wire collectors is used.

OVER 200 GRAVITY BLOCKS SUPPLIED TO OUR CUSTOMERS THROUGHOUT THE WORLD:–



In United Kingdom
Australia
India
Pakistan
France
Belgium

Orders are being executed for U.S.A.

Take up frames for Galvanising, tinning and heat treatment.

The strippers are collapsed pneumatically.

. . . who are the Inventors and Pioneers of this inverted system of drawing.

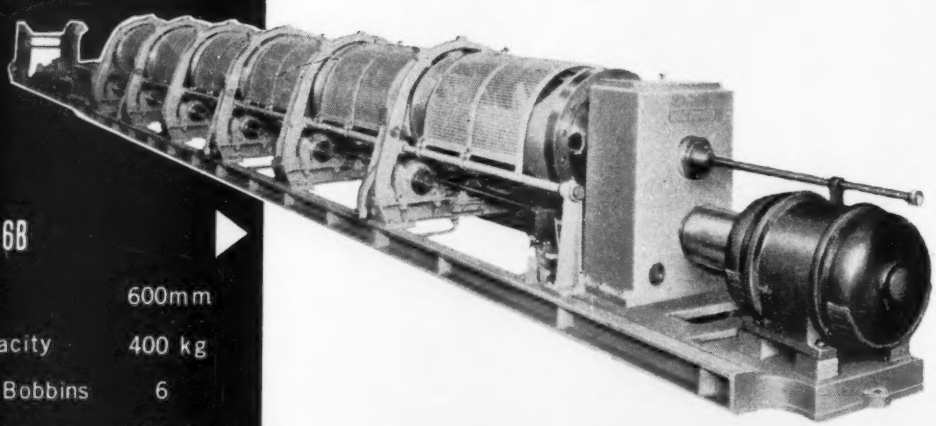
MIYAZAKI

TUBULAR TYPE HIGH SPEED STRANDER

For Your Prosperity !

TYPE: Of our TUBULAR TYPE HIGH SPEED STRANDER. "Bar-system" rotating bodies are adopted in 150mm ~ 300mm bobbin machinery.
BOBBIN SIZE: 100mm ~ 800mm in flange dia.
BOBBIN CAPACITY: 3Kg ~ 900Kg a bobbin. (in copper wire)
NUMBER OF BOBBINS: 2 ~ 45 bobbins.

MACHINERY FOR ELECTRIC-CABLE AND WIRE-ROPE

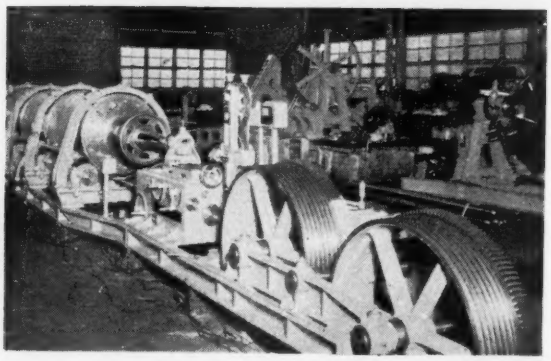


MODEL S24-6B

Bobbin Dia.	600mm
Bobbin Capacity	400 kg
Number of Bobbins	6
Max. Speed	800rpm

DRAW-OFF (S 24-6B)

Capstan (Single or double) or Caterpillar system will be taken according to the customer's offer.



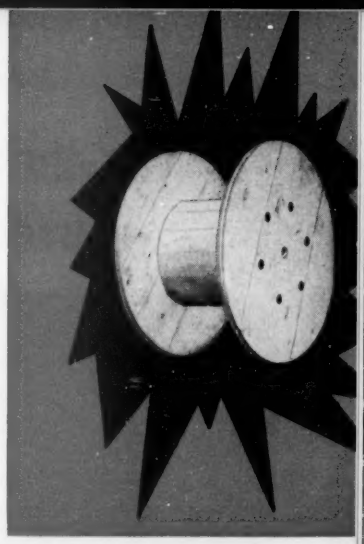
Miyazaki Iron Works, Ltd.
Kaizuka, Osaka, Japan.

Saw mill at Bradford, N. H., where logs are processed into lumber.

HOW BRIDGE SUPPLIES ONLY THE BEST REELS

Our company is progressive. Since we began the manufacture of wood reels our plant has undergone continued expansion and improvement in production facilities.

In recent years modern affiliated companies have been established in New Hampshire to further enable us to better serve the growing needs of the wire industry.



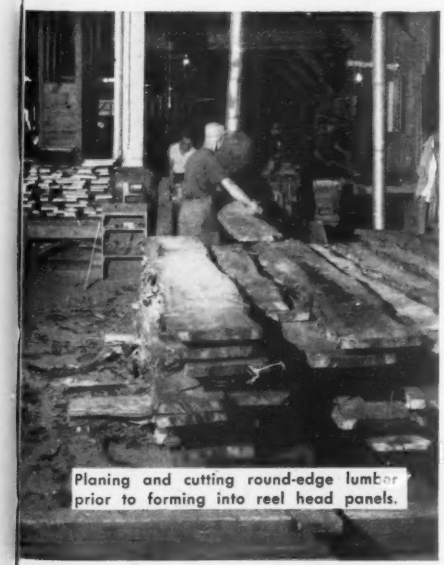
NON-RETURNABLE

WOOD REELS IN ALL SIZES FOR ALL TYPES OF ELECTRIC WIRE AND CABLE

- Controlled saw mill work
- Air seasoning of lumber
- Conversion of stock into panels and square-edge lumber
- Maintenance of millions of board feet of lumber in inventory
- Efficient, modern material handling methods and equipment

Interior of the Kearsarge plant.

Plant of Kearsarge Reel Co. — an affiliate of Bridge Manufacturing Co.



Planing and cutting round-edge lumber prior to forming into reel head panels.

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST

Interior of Hill mill showing manufacture of panels for reel heads.

Hill Box Company's panel mill — another BRIDGE affiliate.

"REEL" GOOD —

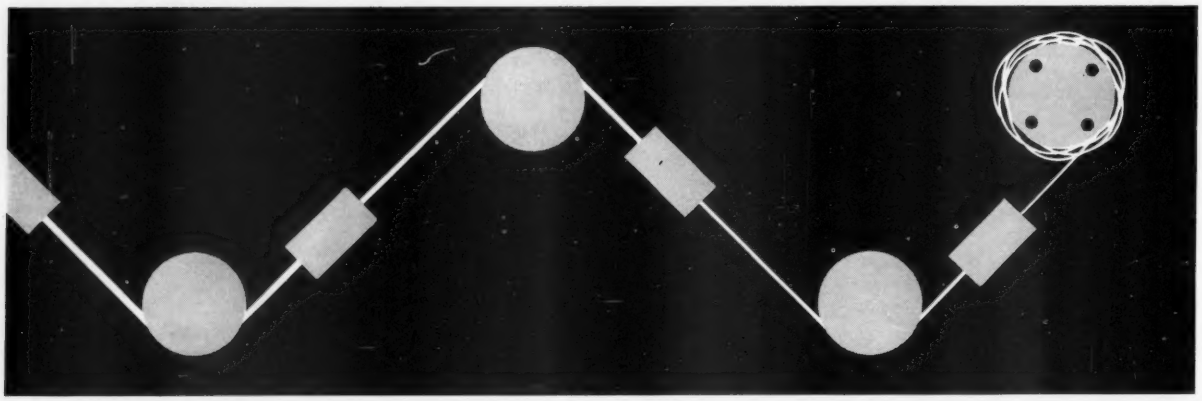
Let us quote on your Reel needs. Send in your specifications. Better yet, visit our plant and see how Reels are made so well at so low a cost.

WOOD REELS

HIGH-SPEED SHIPPING SERVICE IN OUR OWN TRUCKS WITHIN A RADIUS OF 250 MILES OF THE PLANT, FAST FREIGHT WILL BRING YOU BRIDGE REELS WITHIN A FEW DAYS TO POINTS EAST OF THE MISSISSIPPI.

TEL: THOMPSONVILLE, CONN.
Riverview 9-8308

For the highest production you ever had . . . use Molysulfide® wire-drawing lubricants



Increase your drawing speeds ■ Cut costly die changes ■ Slash wire-breakage losses ■ Reduce power consumption ■ Get far greater reduction without intermediate annealing ■ Produce a stronger, better-quality wire product.

Users of lubricants containing Molysulfide commonly get NOT just one advantage, but a whole chain of production efficiencies and product improvements.

For example, typical wire-drawers have obtained results like these:

- Greatly increased speeds. Increases of from 1200 to 1500 fpm on stainless wire, as compared with previous speeds of 400 to 500 fpm. An actual increase of 300%!
- Important die economies. One company found it could dry draw stainless to 1/64" where wet drawing with conventional lubricants would necessitate going to diamond dies at 3/64". Result: 50% more reduction without changing dies.
- Reduced power consumption. Using a Molysulfide lubricant, a prominent wire drawer reduced 1/4" stainless rod to 1/8" wire rod at conventional speeds and under pressures approaching the yield point of steel. Reduction—75%. Power saving—10 to 15%.
- Far greater reductions. Recently, "Moly" made possible the reduction of 0.218" Grade 434 stainless rod to 0.045" wire without intermediate annealing. A 95.7% reduction, working hard drawn stock!
- Fewer rejects and less downtime. Using an MoS_2 lubricant, a drawer of carbon steel wire decreased wire breakage about 10%. Die changes also were reduced—from at least once a week to once every 2 or 3 weeks.
- Improved product quality. A maker of premium wire rope found that MoS_2 was deposited in a microscopic layer on the wire. As a result, less heat was generated, brittleness was avoided, and wire toughness was much improved. In the finished rope, MoS_2 also acted as a lubricant, preventing metal-to-metal contact as the rope flexed, and greatly prolonging rope life.

Superior results have been obtained by many companies producing aluminum core wire, various kinds of high carbon wire, spring wire, specialty metal wires, and other process wires. What this lubricant additive has done for others, it may well do for you. For information on wire drawing lubricants containing Molysulfide, simply call or write us.

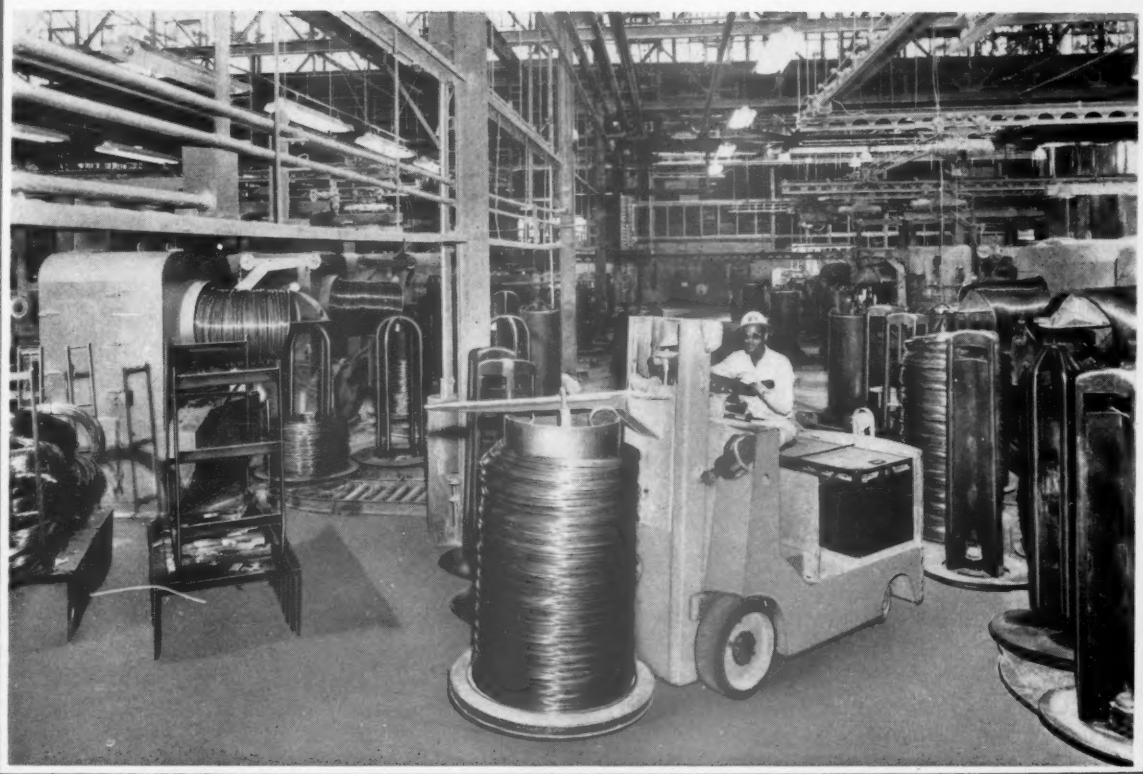
CLIMAX MOLYBDENUM

CLIMAX MOLYBDENUM COMPANY

a division of AMERICAN METAL CLIMAX, INC.

1270 Avenue of the Americas, New York 20, N.Y.

Increase Your Plant Capacity WITH WHITACRE DEAD BLOCKS



Increased wire drawing plant capacity — with a minimum capital investment — is the basic reason for the growing industry preference for Whitacre Dead Block installations. The Sheffield Division of Armco Steel Corporation at Kansas City, shown above, is a current example. During the past two years its plant has been fully dead-blocked with versatile and rugged Whitacre units. It's profitable to swing to Whitacre. Capacity goes up, operating costs go down. Let a Whitacre engineer prove it to you — soon!

For Complete Information, Write:

WHITACRE CORPORATION

5649 Alhambra Ave. • Los Angeles 32, Calif. • CApitol 5-2476

FOR WIRE ROD THAT'S REALLY FINE--

say NIEDERRHEIN

Niederrhein means Quality

Niederrhein, Europe's largest wire rod facility, with its completely modern installations assures close tolerances for diameter and out-of-round, excellent surface and light scale.
Users report exceptionally good mechanical descaling properties.

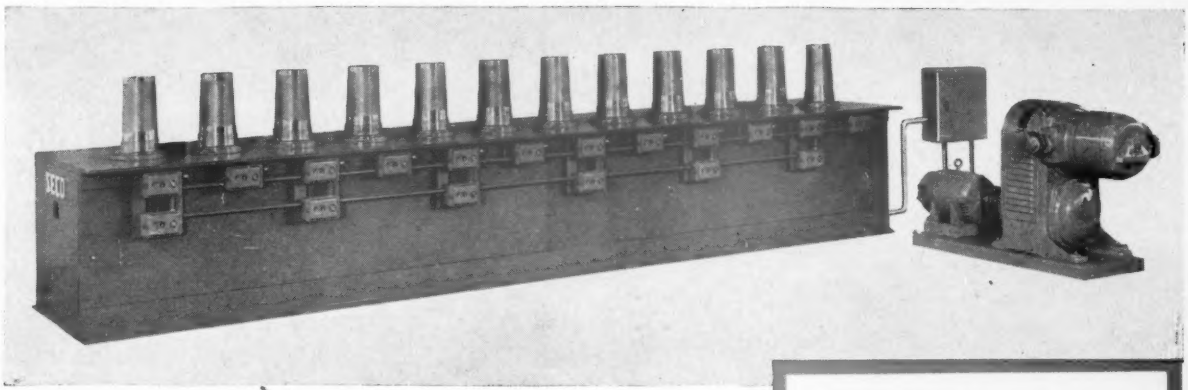
Open Hearth grades from C 1005—1095
Low Metalloid
Thomas (Basic Bessemer) grades
Sizes from .200" —½"
Coils from 180—880 lbs.
Inside diameters 20, 24, 26, 33½"
Unitized bundles of 3000 lbs. are now our standard shipping package
Reliable delivery schedules at a fair price

KURT ORBAN
COMPANY, INC.

34 A Exchange Place. Jersey City 2, N. J.
In Canada: Kurt Orban Canada. Ltd.,
Toronto & Vancouver

SECO Fine wire TAKE-UP FRAMES

The "last-word" in wire-winding efficiency!



- **Simplified Design and Construction**
- **Synchronized Electrical Variable Speed**
- **Noiseless, Vibrationless Running**
- **Greatly Increased Operating Capacity**

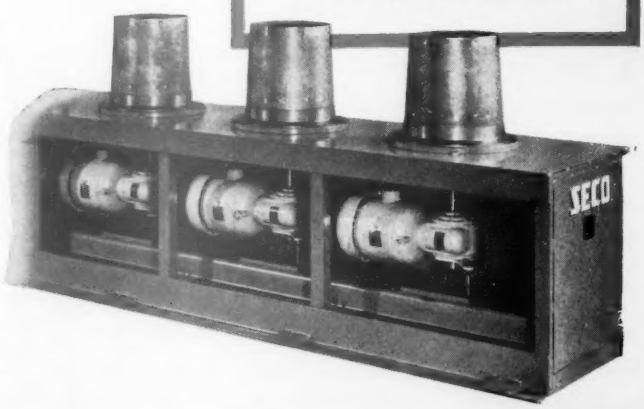
SECO builds take-up frames for handling fine gauge steel or non-ferrous wire on 8", 12", or 16" diameter blocks...with linear wire speeds up to 1,000 FPM or higher. Superior features include a multiple electrical drive system (alternating current) for synchronized electrical transmission of variable speed power.

This gives simultaneous speed changes to all spindle blocks, in ratios up to 5:1 or even 10:1 or higher. It provides push-button stop-start control to each of the gear motors driving each spindle block. Gone is the old bevel gearing, with manually operated clutches for starting and stopping the blocks.

SECO high production take-up frames are constructed to accommodate any number of spindles required. Frames with horizontal spindles can also be built. Call or write for complete information and data. Consultation invited—no obligation.

SHOWN ABOVE:
SECO Take-Up Frame and VARIDYNE Electrical Power Unit which provides synchronized variable speed to the multiple drives. AC current is employed throughout, and the VARIDYNE System "gears" all the drives together by electrical impulses.

SHOWN BELOW:
The AC squirrel-cage induction type gear motors which drive the spindle blocks through hollow bored shafts.



STEEL EQUIPMENT COMPANY
P. O. BOX 737, WARRENSVILLE STATION
CLEVELAND 22, OHIO

SECO

3

BAKELITE®
Polyethylenes give wire 3-WAY protection . . . makes pairs more accessible!

1. SINGLES INSULATION

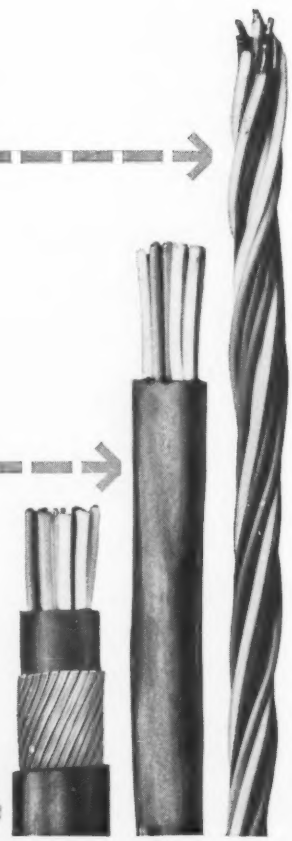
BAKELITE high-density polyethylene provides greater toughness in thinner walls. Resists crushing and cut through.

2. INNER JACKET

of BAKELITE ethylene copolymer does not stick to conductor insulation—any pair can be used to rip cleanly through inner jacket . . . chances of cutting the singles insulation are reduced.

3. OUTER JACKET

Tough polyethylene resists weathering, moisture, corrosives, and provides mechanical protection during installation and underground service.



BAKELITE Brand polyethylene continues to meet modern telephony's highest standards for insulation and jacketing.

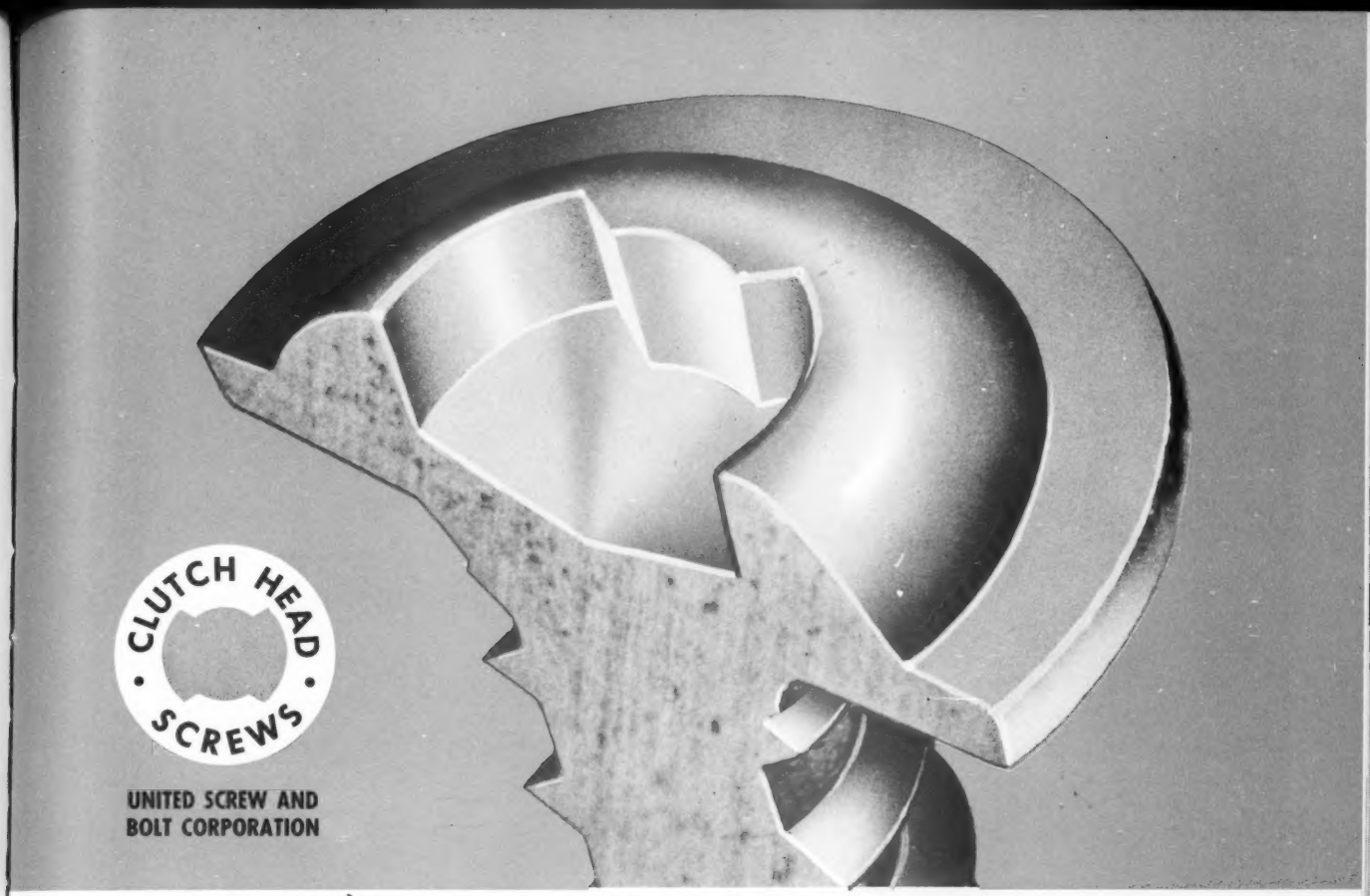
Alphaduct Wire and Cable Co., New Brunswick, N. J., now produces armored, direct buried, multi-pair (3, 6, 12) distribution wire—with insulation, inner jacket and outer jacket made of 3 different kinds of BAKELITE polyethylenes . . . each designed to do a specific job.

In this and in many other communications applications, BAKELITE polyethylene offers outstanding mechanical protection plus low-loss characteristics over a wide frequency range, making possible lower capacitance unbalances, and reduced cross talk and noise level.

For full information on how quality BAKELITE polyethylene can increase the efficiency, performance and reliability of wires and cables for aerial, duct, aboveground and buried installations, write Dept. KY- 160L Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

UNION CARBIDE **PLASTICS**

BAKELITE and UNION CARBIDE are registered trade marks of Union Carbide Corporation.



flowability IS THE SECRET!

BIG HEAD—LARGE BEARING WASHER—THIN SHOULDERS—DEEP, WIDE RECESS—STRAIGHT WALLS—SHARP CORNERS—these are tough specifications that prove the flowability of wire. To successfully produce this fastener requires them all. This is why United Screw and Bolt Corp., Chicago, Illinois, specifies Keystone Special Process Wire for this screw.

K. F. Schmidt, Purchasing Agent for United, says, "We need a wire that gives us improved die life and longer runs. Our experience shows the flowability characteristics of Keystone Wire permit us to cold head exactly to specifications. We find the uniformity of Keystone Wire assures successful production of these clutch head fasteners."

It will pay you to investigate the flowability of Keystone Wire. This may give you that extra advantage you need to cold head more difficult jobs—get greater production—reduce machine downtime—increase die life—make more profit. We'll help you find out.

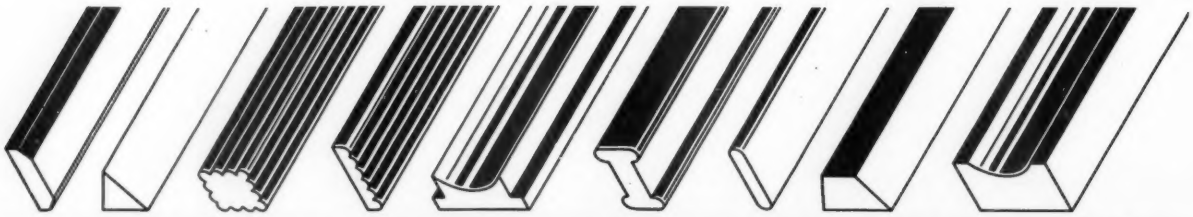
KEYSTONE SPECIAL PROCESS WIRE STUDY

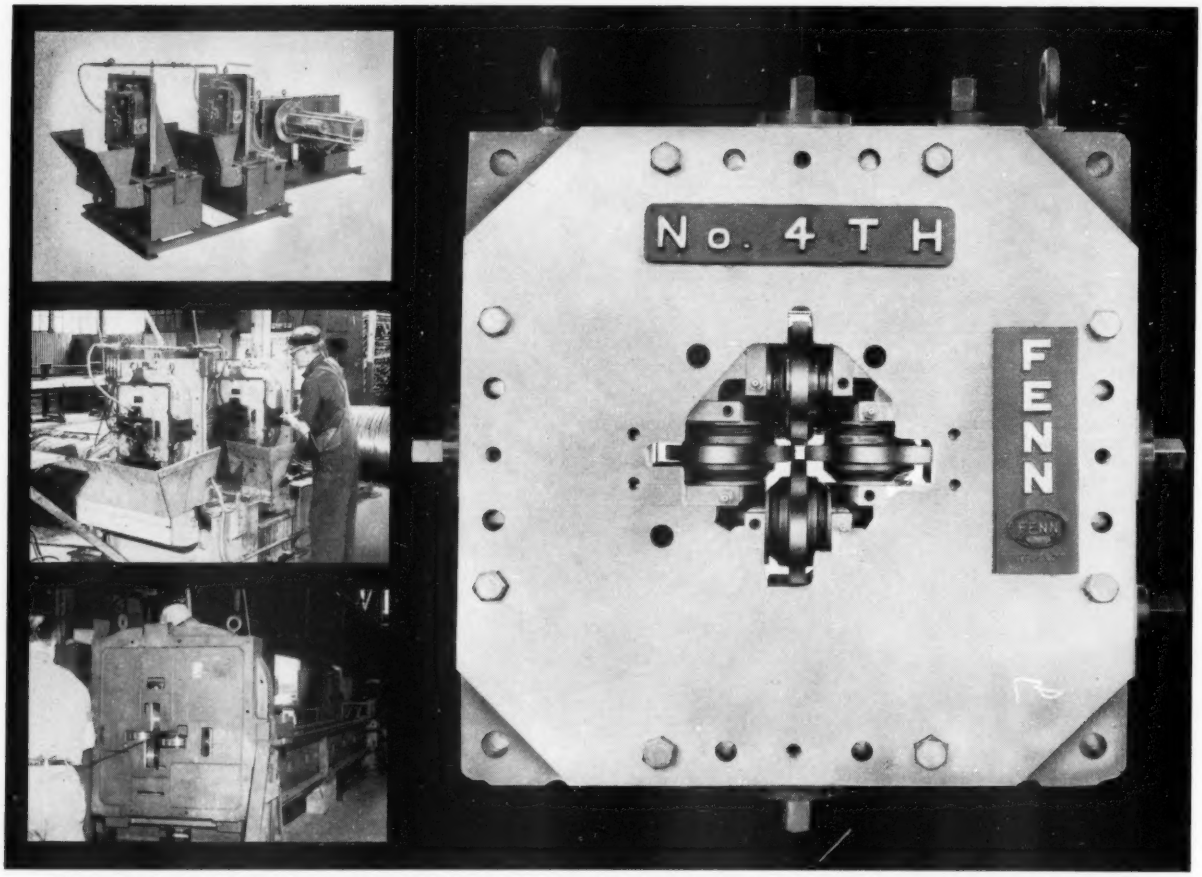
Keystone Steel & Wire Company, Peoria, Illinois

KEYSTONE

WIRE FOR INDUSTRY

MADE AT PEORIA, ILLINOIS, U.S.A.

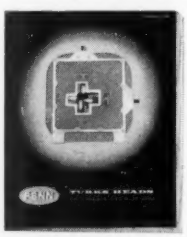




Top and Center — *Wire Shaping Mills with tandem Turks Heads.* Bottom — *Turks Head with Draw Bench.* Right — *Fenn Combination Type Turks Head.*

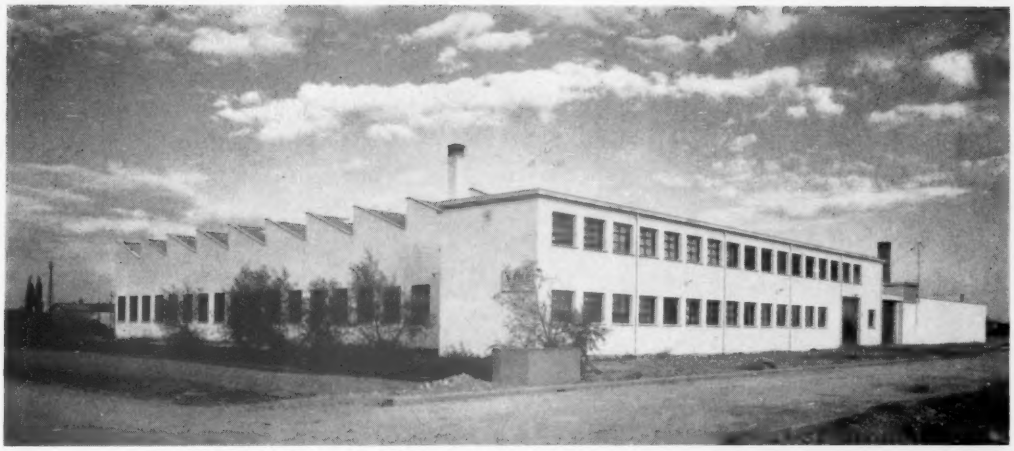
Wire Shaping with FENN Turks Heads

Fenn has pioneered the development of the Turks Head to their present day wide usage for precision production wire shaping. Used on the Wire Shaping Mill (developed by Fenn), on draw benches, or in tandem with Rolling Mills, Fenn Turks Heads produce many precision shapes, both plain and special, such as shown above, with both ferrous and nonferrous wire and rod. They aid in size control, and impart a fine surface finish. Fenn manufactures a complete line in plain, universal, combination and triangular types with bearing capacities at 100 RPM up to 56,400 pounds for heavy reductions. Fenn also makes the important accessories, such as capstans and take-up reels. If it's a wire-shaping problem or requirement, chances are Fenn can help you. Fenn's central engineering department and field engineers are ready to assist you. A copy of the Turks Heads Catalog No. TH56 will be promptly sent upon request.

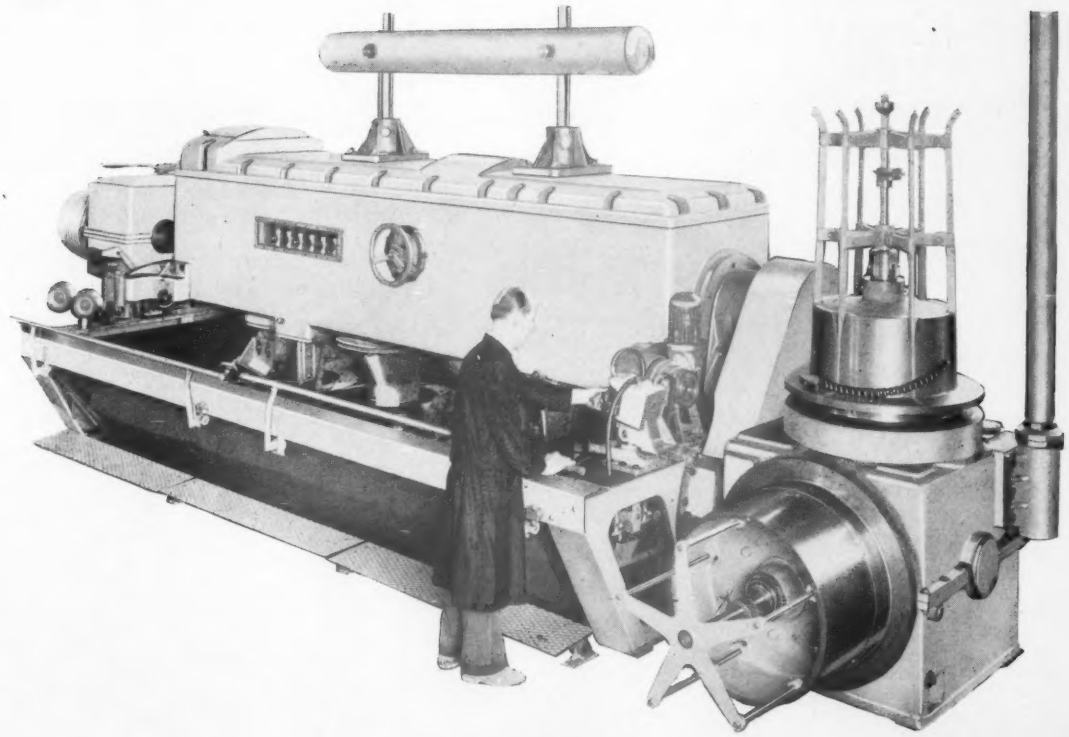


The Fenn Manufacturing Company, Newington, Conn.

"SAMP"



Multiwire drawing machine – UNIVERSAL model MM-1/T
for drawing Trolley wires etc.



Soc. p. Azioni
Meccanica di
Precisione

SAMP

Bologna
(Italy)
Via Galliera 12
telef. 235400
227400

Wire Rope Manufacturers: Save $99,400 Per Year!

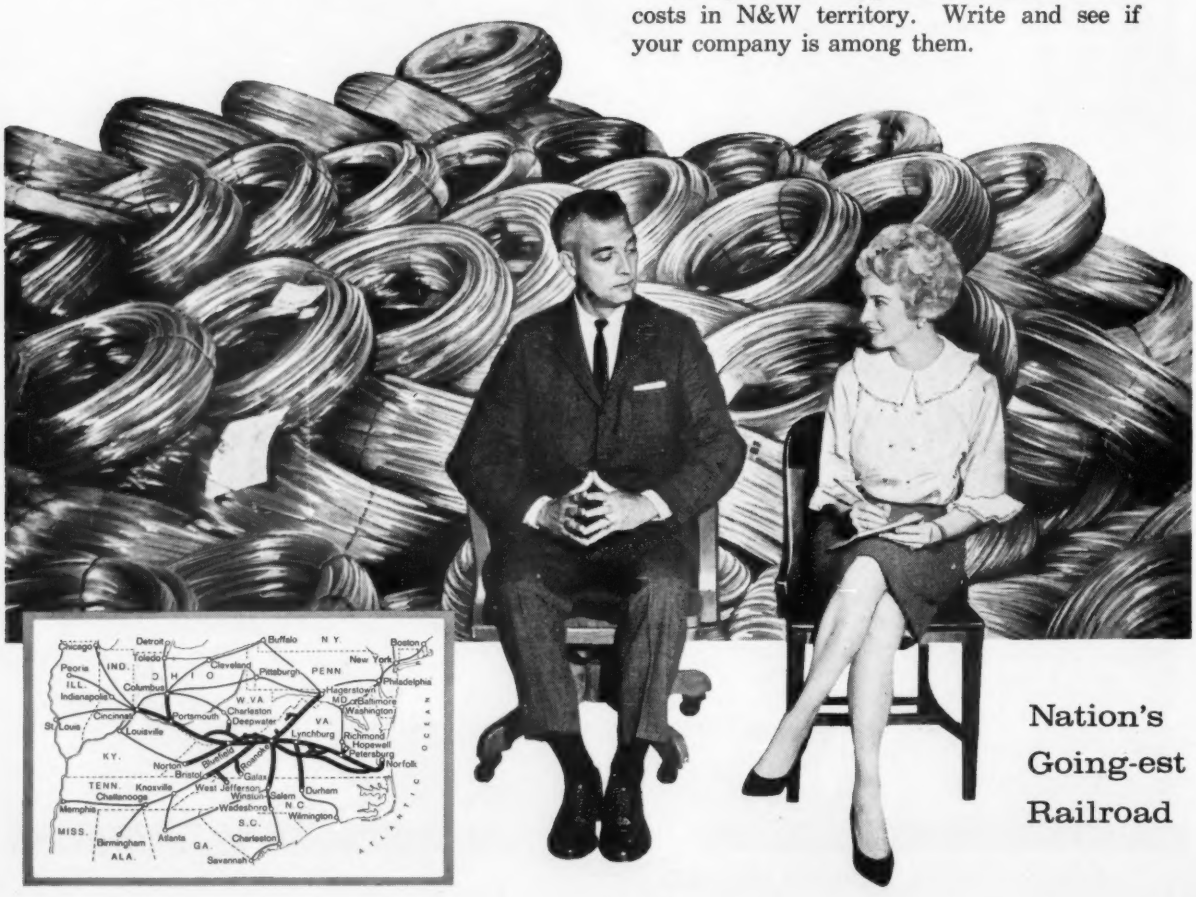
A comprehensive study of N&W territory, by Fantus Area Research, revealed ideal sites for wire rope plants. Estimated operating costs at these sites were compared with actual operating costs of wire rope plants around the nation. Result: at the N&W sites a wire rope plant can save $99,400 a year. Want details? Write on company letterhead to H. P. Cotton, Assistant Vice President, Norfolk & Western Railway, Roanoke, Va.

N&W

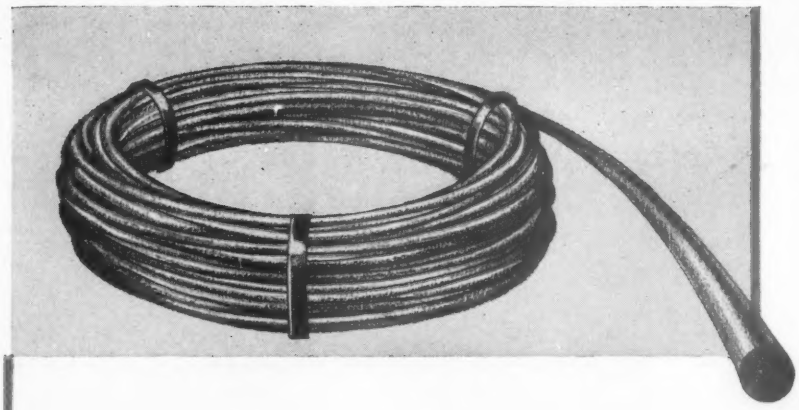
NORFOLK and WESTERN RAILWAY

GENERAL OFFICES • ROANOKE, VA.

Many Other Types of Plants can cut costs in N&W territory. Write and see if your company is among them.

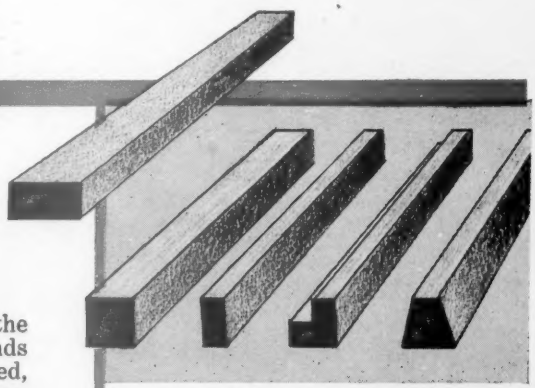


Nation's Going-est Railroad



For Your Special Requirements Use

EATON-RELIANCE COLD FINISHED STEELS

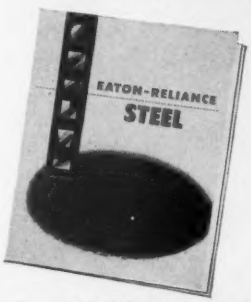


Eaton-Reliance can furnish shapes in the range of .020″ x .020″ to ½″ x $\frac{9}{16}$″—rounds up through $1\frac{1}{16}$″ (coils or bars)—cold rolled, cold drawn special shapes—keystone—centerless ground, finished to your specifications. Produced by the most modern machinery under the most exacting quality control procedures, you can be assured Eaton-Reliance special steels will meet your requirements.

All steel finishing is done in our own mill by experienced craftsmen who draw and roll steel for ball and roller bearings —rings—springs—keys—pins and cold heading. Countless sections are available including round, square, flat, rectangular, step section, keystone and hex.

Eaton-Reliance also cold finishes several non-ferrous metals in addition to carbon, stainless and alloy steels.

Write for our 8-page catalog containing information about Eaton-Reliance cold finished steels and non-ferrous metals. No obligation.



EATON

RELIANCE DIVISION

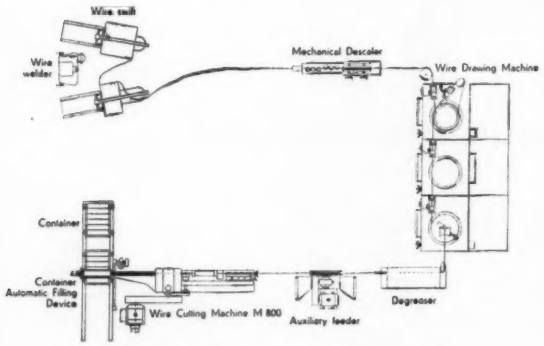
MANUFACTURING COMPANY

510 CHARLES AVENUE • MASSILLON, OHIO

SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Los Angeles

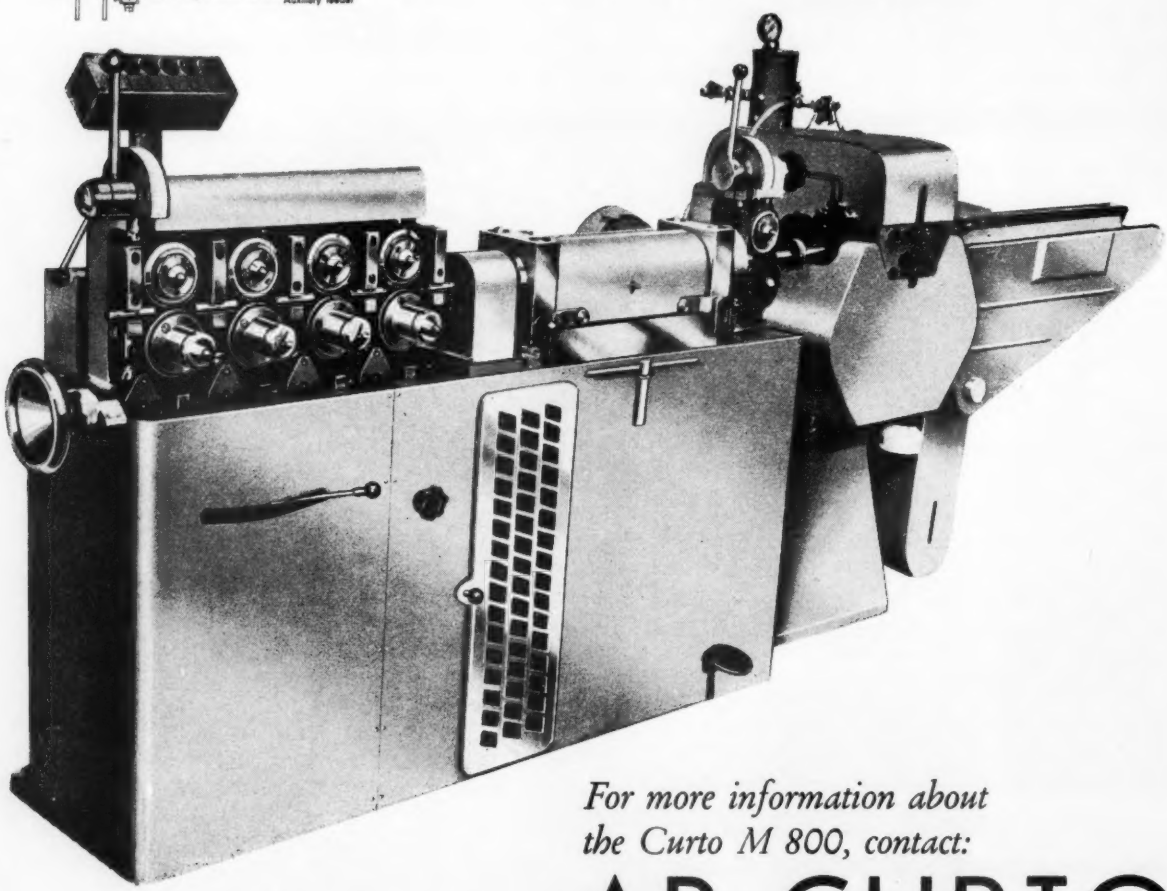
10^8 perfect electrode core wires per year with only one Curto M 800*

The straightening and cutting machine which rationalizes your production of welding electrodes



The Curto M 800 has the following outstanding advantages:

1. Continuous production and much greater capacity (800 cuts a minute)
2. Less personnel requirements
3. Less space requirements
4. No drawn wire stores required



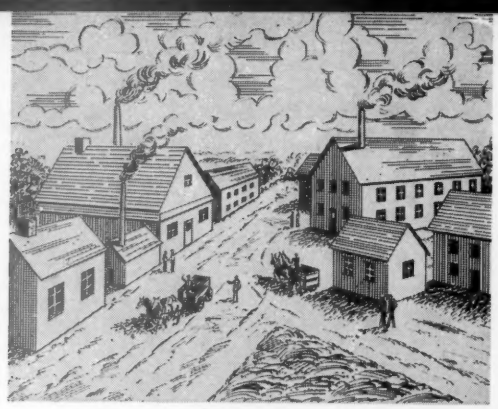
For more information about the Curto M 800, contact:

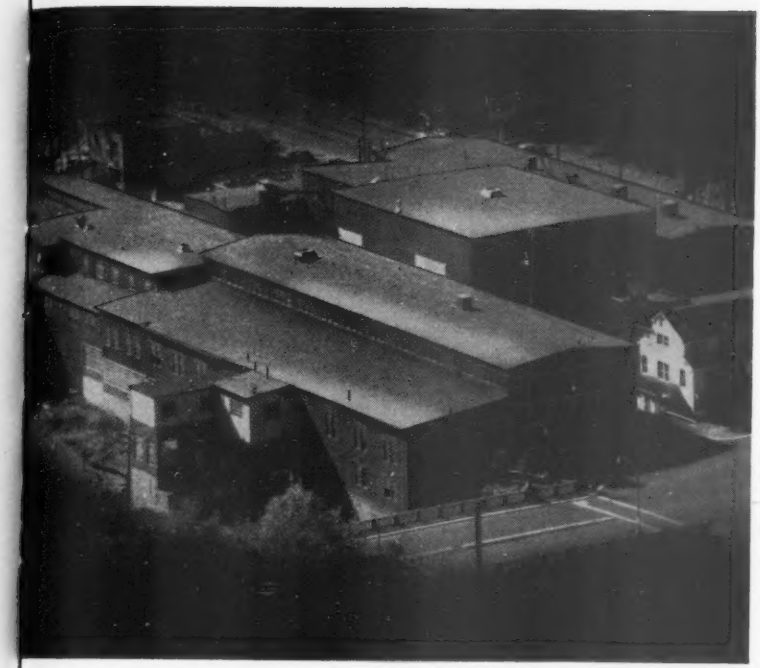
AB CURTO

VASAPLATSEN 3, GOTHENBURG, SWEDEN
Sole distributors for US and Canada MH Machines Cleveland OHIO

*The figure mentioned in the heading indicates the exceptional capacity of the Curto machine. This figure has been arrived at as follows: 800 cuts per minute, 60 minutes per hour, 7 working hours per day, 300 working days per year.

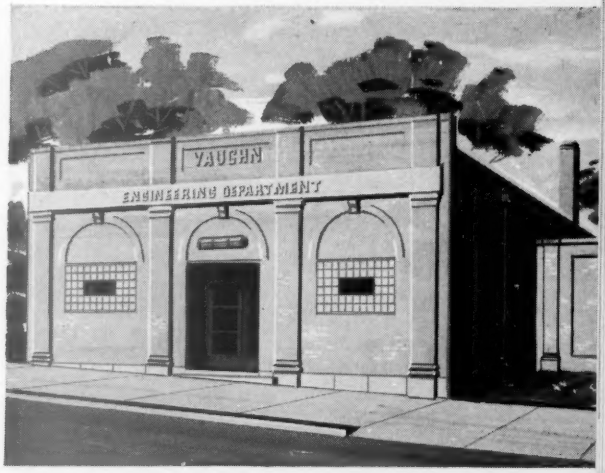
the PAST...





PRESENT

and FUTURE



# of BETTER COLD DRAWING for Industry

Modern cold drawing began in fact with the introduction of the Vaughn Motobloc in 1924—a great surge forward in the pace of Vaughn mechanical development that started with our first rod frame in 1871.

The Motobloc was followed by the Motoblox, and progress has accelerated steadily with ever-faster and more productive models to the present day, included in the world's only complete line of cold drawing equipment.

Tomorrow is on the drawing boards at Vaughn, with methods and machines that in their time will change again the thinking of an industry. That future is clearly defined by the accomplishments of four generations of continuous Vaughn leadership and the invaluable contributions of progressive wire, bar and tube manufacturers.

Let us work with you on your coming production requirements.

The VAUGHN MACHINERY COMPANY

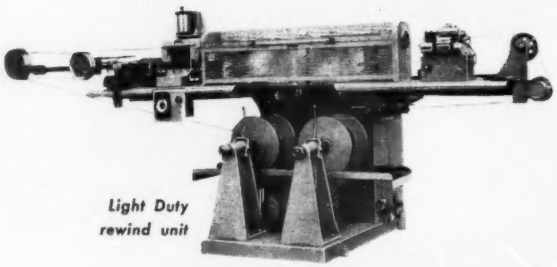
CUYAHOGA FALLS, OHIO

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

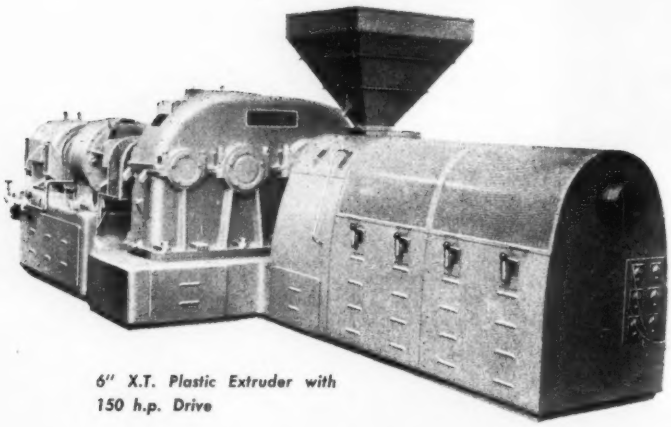
CONSULT GENERAL FOR

WIRE ENAMELLING EQUIPMENT

'GENERAL' foremost manufacture of complete automatic and semi-automatic cable covering installation, re-winding, testing and general extrusion plant

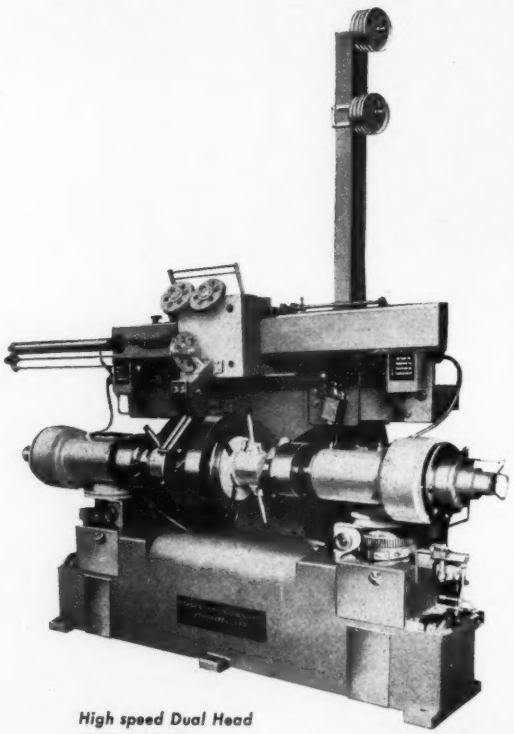


Light Duty rewind unit



6" X.T. Plastic Extruder with 150 h.p. Drive

Fully automatic equipment for telephone, switchboard and domestic cables on to reels or coils. Dual purpose lines for insulating and sheathing, making full use of high speed machines. Heavy equipment suitable for cables up to 6" diameter including lines for polythene H.F. cables, and Trans-Atlantic type telephone cables, in 26 nautical mile lengths. Pay-off and take-up stands made to suit customers' requirements, shaft or shaftless type, pneumatic or hydraulic operation, maximum capacity 70 tons.



High speed Dual Head Coiling Machine

GENERAL

GENERAL ENGINEERING CO., (RADCLIFFE) LTD.

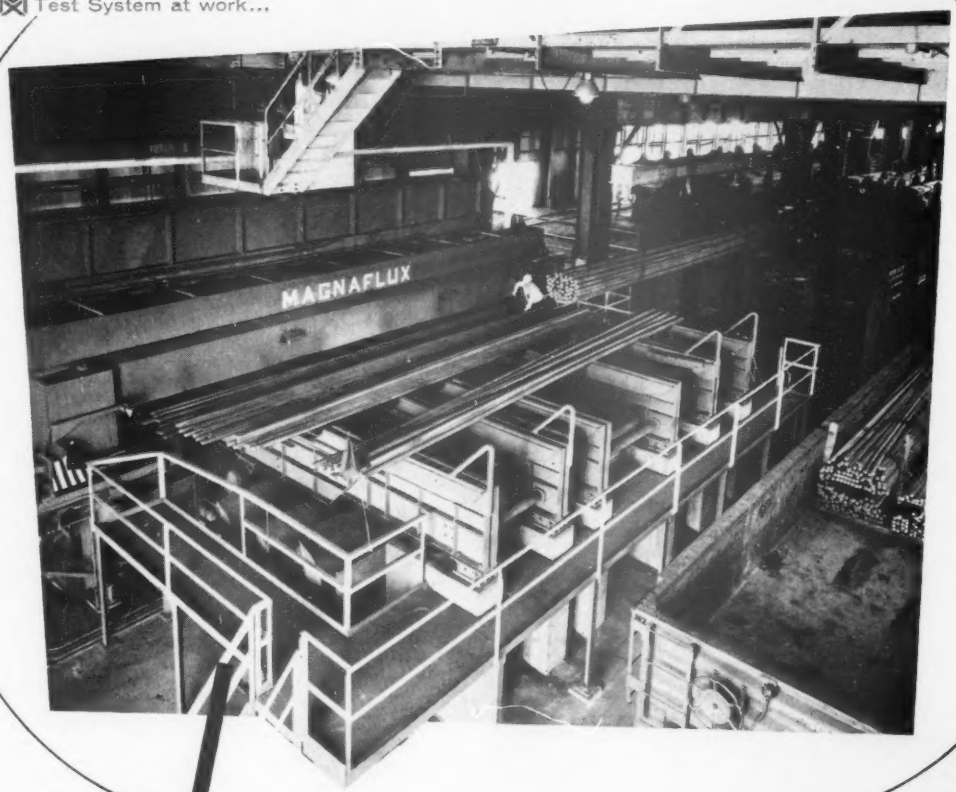
STATION WORKS, BURY ROAD, RADCLIFFE, MANCHESTER, ENGLAND.

Telephone: RADcliffe 2291 (4 lines)
Telegrams: 'GENERAL' Radcliffe, Manchester

Canadian Agents: H. J. R. Court, Box 588, Georgetown, Ontario, Canada.

American Agents: Wire Equipment Division, Michigan Oven Company, 415 Brainard Street, Detroit 1, Michigan.

Another MX Test System at work...



Another Magnaglo Billet Conditioning Installation

This complete Magnaglo system was designed and produced by Magnaflux Corporation. It is just one example of Magnaflux ability to engineer and fabricate complete automated handling and testing systems for the steel industry.

A well-integrated Magnaglo inspection and handling system gives you better, more complete, control of billet quality from conditioning. And you can control the Magnaglo sensitivity to identify only the seams you want to scarf. This makes possible increased mill yield, substantially reduced billet conditioning costs, and consistently higher quality in the semi-finished state.

More and more mills are taking advantage of the years of experience gained by Magnaflux, the pioneer developer of magnetic particle test-handling systems for billets, tube rounds, and welded or seamless tubing and pipe. Now, how can we help *you*? Phone your local MX Field Engineer or write to Magnaflux Corporation, 7346 West Lawrence Ave., Chicago 31, Illinois.

MAGNAFLUX CORPORATION
A SUBSIDIARY OF GENERAL MILLS
General Mills
TEST SYSTEMS

MX Test Systems Include MAGNETIC PARTICLE, FLUORESCENT PENETRANT, THERMOGRAPHIC, EDDY CURRENT, ULTRASONIC, STRESS ANALYSIS, GAMMA RAY SERVICE, DYE PENETRANT & MAGNETIC FIELD

Best rest comes from wire spring coils—hundreds of them laced together in an innerspring mattress unit like this at Kay Manufacturing Corporation's High Point, N. C., plant. Pittsburgh Steel supplies Kay with 8-15½ gage upholstery spring wire for innersprings and high tensile wire for exclusive Kay-Arc sinuous springs for furniture.

PITTSBURGH STEEL UPHOLSTERY WIRE HELPS PUT THE "ZZzzzz" IN KAY SLEEP PRODUCTS

To assure restful comfort to the people who use his products, there's no rest for a manufacturer of innersprings.

Because he's dealing with one of the most basic human wants—personal comfort—the innerspring producer dare not be caught napping on product quality. But he can take comfort in Pittsburgh Steel Company's high carbon wire.

Kay Manufacturing Corp. of Brooklyn, N.Y., does—as do many other spring manufacturers.

One of the largest suppliers of springs and other components to bedding and furniture manufacturers, Kay depends on Pittsburgh Steel for substantial quantities of automatic knotting and coiling quality upholstery spring wire, and high tensile wire for sinuous furniture springs.

Why? Because Kay knows it can count on Pittsburgh Steel for high carbon wire with the consistency of size, tensile strength, ductility, toughness and soundness that form the starting point for innerspring superiority.

Plant Manager Martin Tuska of Kay's High Point, N.C., plant explains:

"To produce innerspring units with uniform characteristics, it's absolutely necessary that the wire forms and sets into springs that are identical in height, pressure, diameter and pitch.

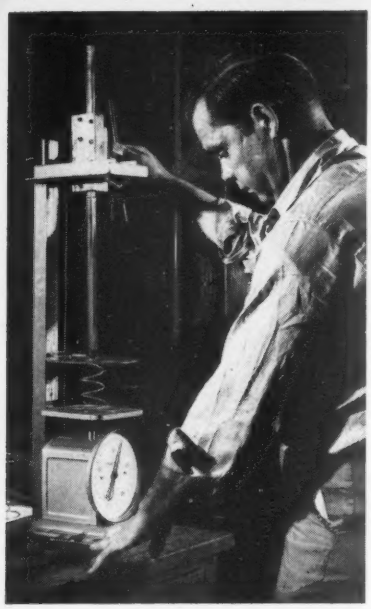
"The wire can't have any hard or soft spots. We double wrap knots over the second turn on one or both ends of the coil. That takes high carbon wire with high, uniform ductility because the wire is twisted twice around its own diameter.

● **Needs toughness**—"It has to have special toughness, too. That is, it must have the strength and ductility to be compressed countless times without showing fatigue—to provide the deep, unchanging resiliency that only an innerspring can give.

"I'd say that the quality and performance of Pittsburgh Steel's high carbon wire, from coil to coil, is very good."

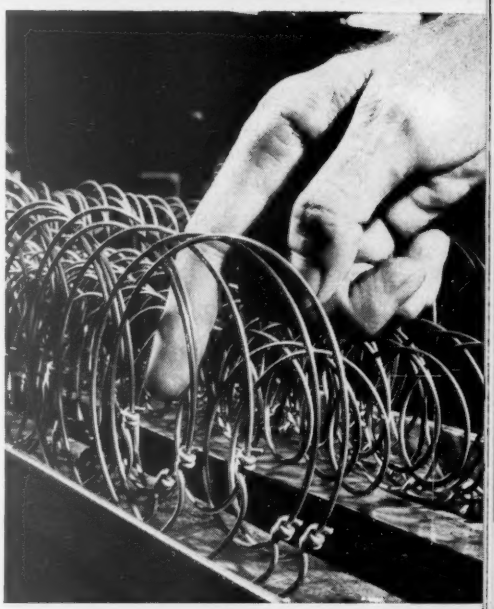
Using upholstery spring wire from 8 to 15½ gage, Kay's High Point plant produces several hundred assembled innerspring units per day for many of the country's largest manufacturers of mattresses, dual-purpose sleep equipment and furniture.

Featuring the highest degree of



Compressed 2 inches, 5-turn innerspring of Pittsburgh Steel upholstery wire must respond with pressure reading of 6½ pounds; must hold height within ⅛-inch after stress relief.

Uniformity of Pittsburgh Steel wire assures long production runs on coiling and knotting equipment. Five-inch, five-turn coils are held to ½-inch tolerance in pitch and diameter.



Ductility and tensile strength of wire get their toughest test during knotting. Kay double-knots innersprings, automatically twisting wire twice around its own diameter.

uniformity, units are assembled on automatic lacing machines in all standard sizes and coil counts from springs that are individually stress relieved immediately after coiling.

Through a quality control system based on programmed inspections, as well as spot checks, Kay maintains identical product uniformity through all seven production plants from coast to coast.

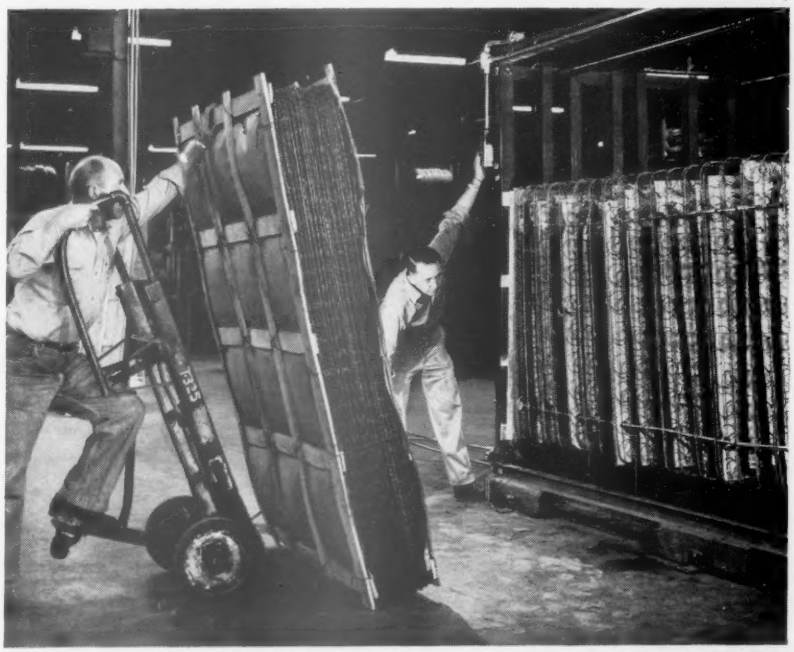
By making extra efforts to assure its customers a product of highest quality, Kay provides further proof of the superiority of innerspring bedding and furniture.

Steel spring construction, unlike slab-type bedding and furniture, offers the manufacturer-assembler versatility and wide flexibility in:

- **Design of finished product.**
- **Control of resiliency, density and degree of comfort.**
- **Selection of special finishing materials and components.**
- **Promotional features for attracting retail buyers.**

If you're a bedding and/or furniture manufacturer, take advantage of these benefits. They're available only with innersprings.

Or, if you're a bedding and furniture spring manufacturer, take advantage of the benefits inherent in Pittsburgh Steel Company's high carbon wires. The same experience in producing wire for special applications that helps Kay Manufacturing Corp. is available to you, too, from Pittsburgh Steel. Just contact one of the offices listed at the right.



Twenty completed innerspring units compress into a bale 11 inches thick—little more than twice the thickness of a single unit. Baling reduces bulk in shipping yet units retain full depth, resiliency when unpacked.

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

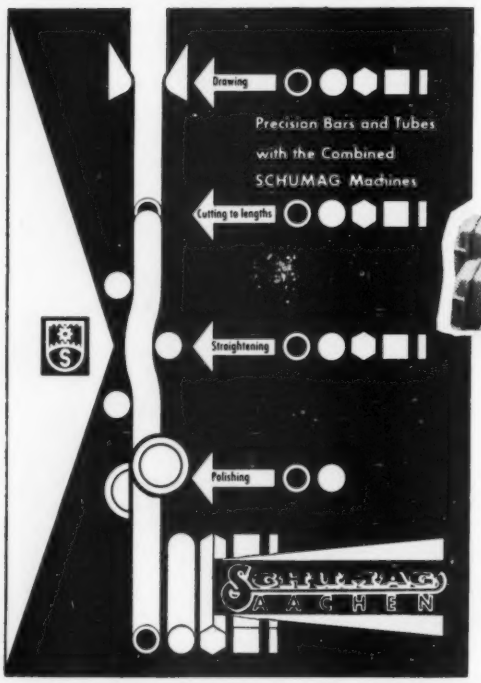
DISTRICT SALES OFFICES

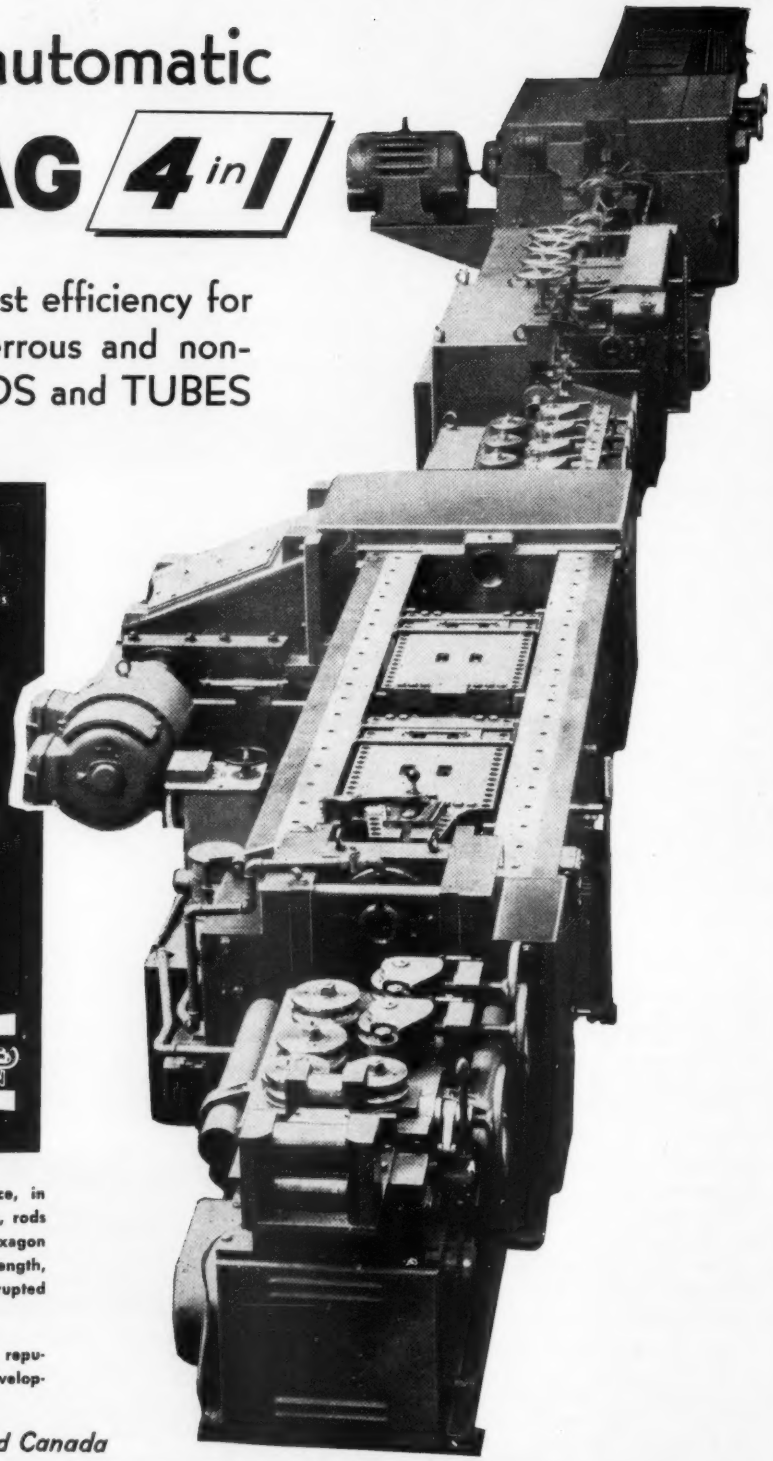
Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

Steel

The fully automatic
SCHUMAG 4 in 1

ASSURES... greatest efficiency for manufacturers of Ferrous and non-Ferrous BARS, RODS and TUBES





- SCHUMAG "4 in 1" machines produce, in one continuous operation, finished bars, rods and tubes from round, square or hexagon material. They will finish draw, cut-to length, straighten and polish in one uninterrupted sequence.
- SCHUMAG "4 in 1" enjoys world-wide reputation as the ultimate in technical development.

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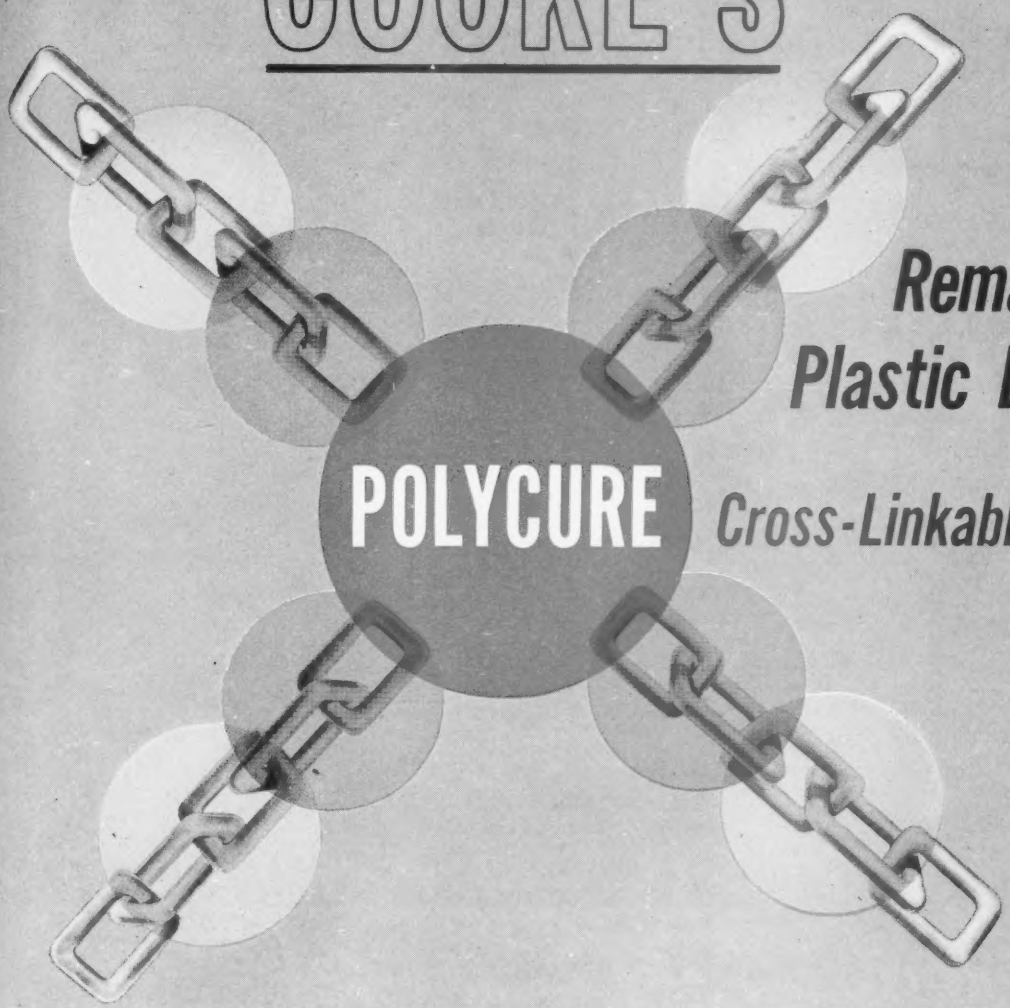
SCHUMAG AACHEN

COOKE'S



Remarkable New Plastic Development

POLYCURE *Cross-Linkable Polyethylene*

POLYCURE is the latest from Cooke - a Vulcanizable Polyethylene, licensed under U. S. Patent No. 2,888,424. This new compound is available in colors as well as black for applications requiring better properties as listed below.

Write today for detailed POLYCURE information.

- **Moisture Resistant**
- **Ozone Resistant**
- **Chemical Resistant**
- **Toughness**
- **Impact Resistant**
- **Weather Resistant**
- **Compact and Light Weight Construction**
- **Heat Stability and Ageing**
- **Electrical Property**
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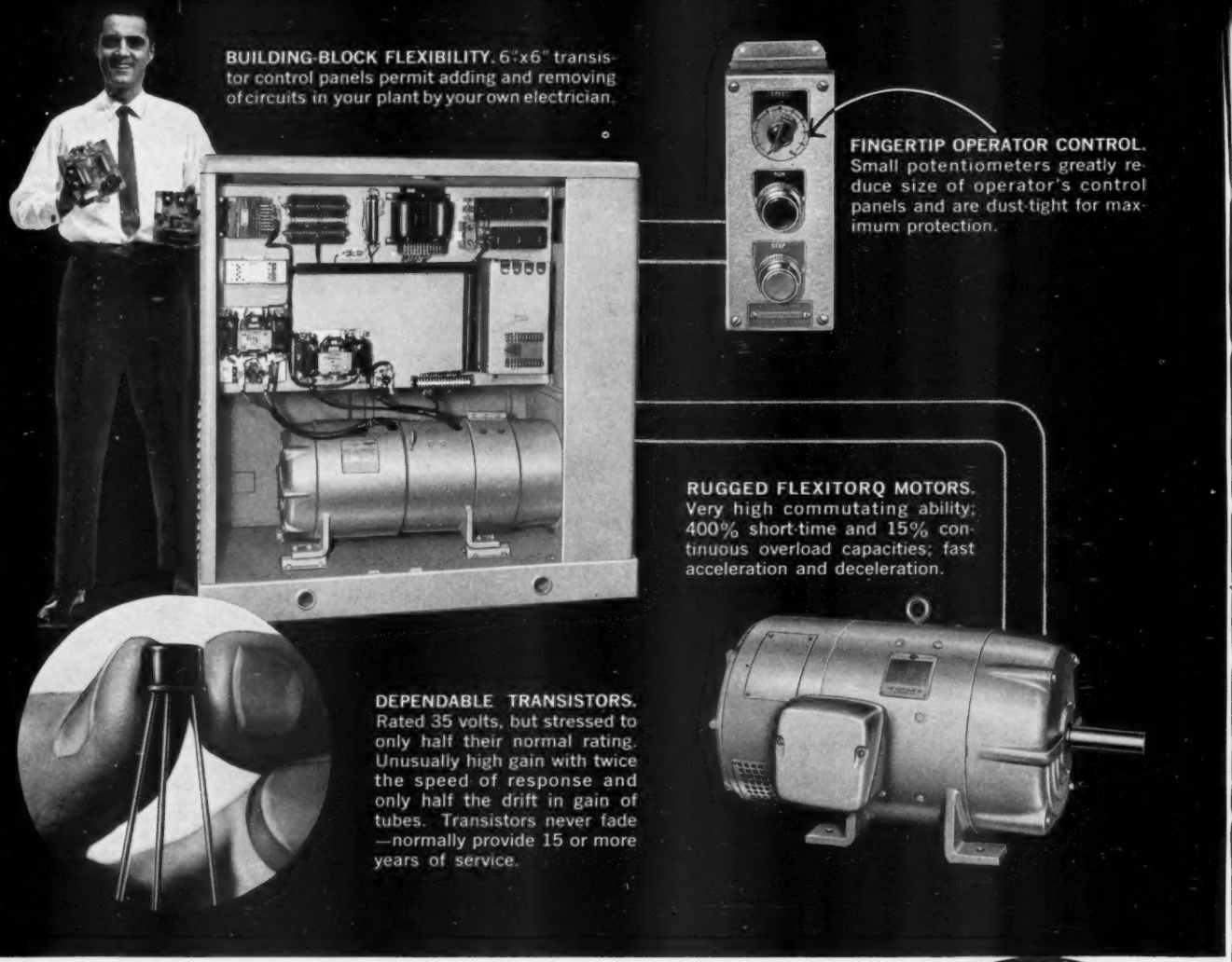
COOKE COLOR & CHEMICAL CO.

Hackettstown, N. J. GArden 5-5935


BUILDING-BLOCK FLEXIBILITY. 6"x6" transistor control panels permit adding and removing of circuits in your plant by your own electrician.
FINGERTIP OPERATOR CONTROL. Small potentiometers greatly reduce size of operator's control panels and are dust-tight for maximum protection.
RUGGED FLEXITORQ MOTORS. Very high commutating ability; 400% short-time and 15% continuous overload capacities; fast acceleration and deceleration.
DEPENDABLE TRANSISTORS. Rated 35 volts, but stressed to only half their normal rating. Unusually high gain with twice the speed of response and only half the drift in gain of tubes. Transistors never fade —normally provide 15 or more years of service.

The New LOUIS ALLIS Select-A-Spede® Drive —First with field-proved All-Transistor Control

a high-gain, high performance d-c drive with unmatched flexibility and low upkeep

Here's a superior adjustable speed drive with simplified transistor-magnetic amplifier control. It's the easiest drive to set up and operate. A twist of the dial gives you stepless speed adjustment from zero to full speed in either direction. Each adjustment is independent, thus sparing you the need for compensating adjustments of inter-related settings. You get more consistent day to day operation because transistors — *unlike tubes* — are highly dependable.

The new Select-A-Spede defies obsolescence. To add functions you simply have your electrician install any of 13 "building-block" control circuits as your conditions require. These circuits come on inexpensive 6" x 6" panels ready for installation and are immediately available from Louis Allis stock. Thus a rebuilding or adaptation job that, on former equipment, cost thousands of dollars — excluding downtime — can now be done at a fraction of the cost and time *right in your own plant!* High quality transistors, field proven in missiles and other advanced electronic equipment, assure you of a high degree of dependability with a life expectancy of 15 or more years. Printed low-voltage transistor circuits are virtually trouble-free and can be quickly and easily replaced from low-cost stock.

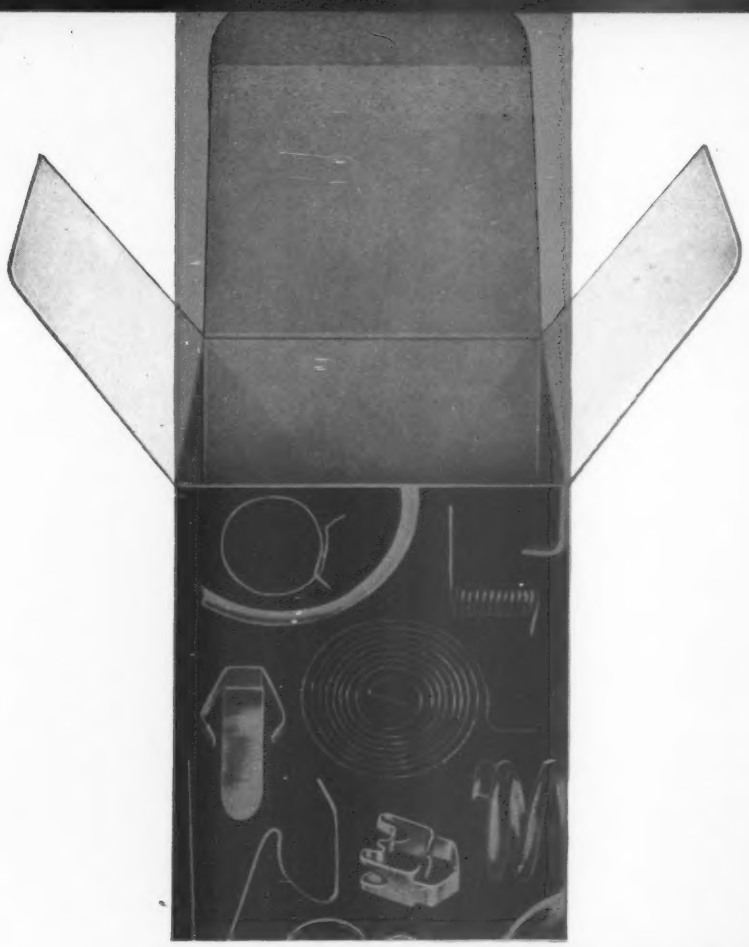
Further savings are provided by the new Louis Allis Flexitorq® drive motors through vastly improved commutation, low brush wear, and their ability to safely withstand momentary overloads of 400% of normal horsepower rating.

Select-A-Spede sizes from 5 to 400 hp, speed ranges up to 20:1. Contact any one of the 60 Louis Allis District Offices for information and application assistance. Or write for bulletin 2001 to The Louis Allis Co., 451 E. Stewart Street, Milwaukee 1, Wisconsin.

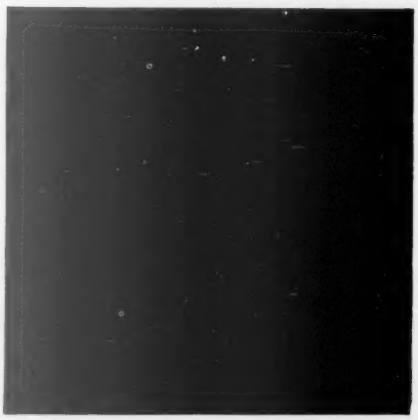
LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

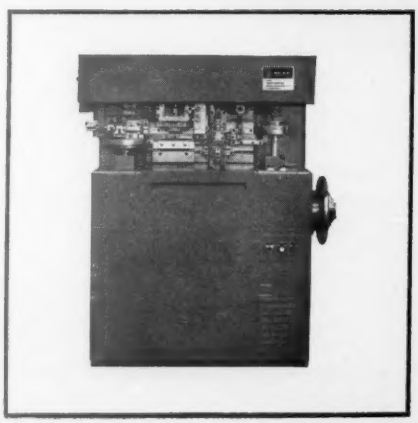
SA-202



If the parts you make can fit in this box, Torrington can fit into your plans. We'll send you this mailing box for your parts and cost them without obligation. For wire forms, strip forms and springs, there's a Torrington machine to make them better, faster and for less.



TORRINGTON
MANUFACTURING COMPANY
MACHINE DIVISION, TORRINGTON, CONNECTICUT



Canadian National Telecommunications uses No. 6 ACSR wire (Aluminum Conductor Steel Reinforced Wire). This wire is sheathed in Hi-fax only 0.031 inches thick.

HI-FAX® keeps communications lines in service longer

To minimize "cross talk" or other interference, Canadian National Telecommunications transposes its lines through special brackets. High winds rubbing wires against bracket insulators tend to wear low-density insulation on the conductors.

By using high-density polyethylene coating for communications wire on some of their circuits, CNT got a wire insulating sheath with better mechanical properties and superior abrasion resistance. Line maintenance reduction and customer service improvement are anticipated.

Hi-fax was the first high-density polyethylene used to coat wire and cable. Its high molecular weight and excellent combination of properties continue to rate first place for applications where abrasion, cut-through, and heat crack resistance are a must.

Hi-fax is the only high-density polyethylene specifically designed for extrusion. It provides wire-coating speed, gauge tolerances, and freedom from pinholing that help produce better insulated wire at low cost. Write or call Hercules for further information.

HERCULES POWDER COMPANY
INCORPORATED

QP61-10

POLYMERS DEPARTMENT • HERCULES TOWER, 910 MARKET STREET, WILMINGTON 99, DELAWARE

WAFIOS ZIG-ZAG SPRING MACHINES

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SOFAS
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MAKES THEM ALL!

World's Most Complete Line of Spring Coiling Machines

ACHIEVE TREMENDOUS PRODUCTION SPEED AND LOWEST COSTS WITH THE SLF /4 and SLF /4-S ZIG-ZAG MACHINES

- **PRODUCTION**—Up to 105'/min.
- **WIRE DIA.**—.100 to .162
- **SPRING WIDTHS**—1-5/8" to 2-5/32"
- **SPRING PITCH**—1.6" to 2.4"
- **SPRING LENGTHS**—10" to 72"

Write for Complete Details and Quotes

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WAFIOS-MASCHINENFABRIK, WAGNER FICKER & SCHMID, REUTLINGEN GERMANY
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. . . because G-E Man-Made diamond is manufactured to rigid specifications insuring crystals of uniform blocky shape and consistent quality.

Manufacturers of lapping compounds and powders report better shaping and sizing of the diamond can be achieved with G-E Man-Made diamond. A real plus for lapping applications!

Why not see if lapping compounds and powders containing G-E Man-Made diamond can increase economy in the sizing and polishing of your wire, bar- and tube-drawing dies? Request lapping compounds and powders with G-E Man-Made diamond today from your supplier. You'll find *the payoff is performance.*

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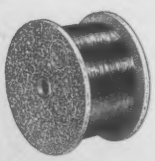
CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • SPECIALTY ALLOYS



This lightweight "No Charge" spool is typical of Roebling's modern packaging methods that save customers time and money.

Are You Getting What You Pay For?

When you pay for HIGH QUALITY high-carbon wire, you want to be sure you get it. You do, when it is supplied by Roebling.

It is unsurpassed in quality, consistently true to specifications, and absolutely uniform in gauge. Hundreds of manufacturers attest to this fact... the qualities that they *pay* for — they *get* in Roebling high-carbon wire. The length of our relationship with customers proves it.

We'll be glad to show you what we mean. For information on superior high-carbon wire or cold rolled strip, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

ROEBLING

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Roebling... Your Product is Better for it

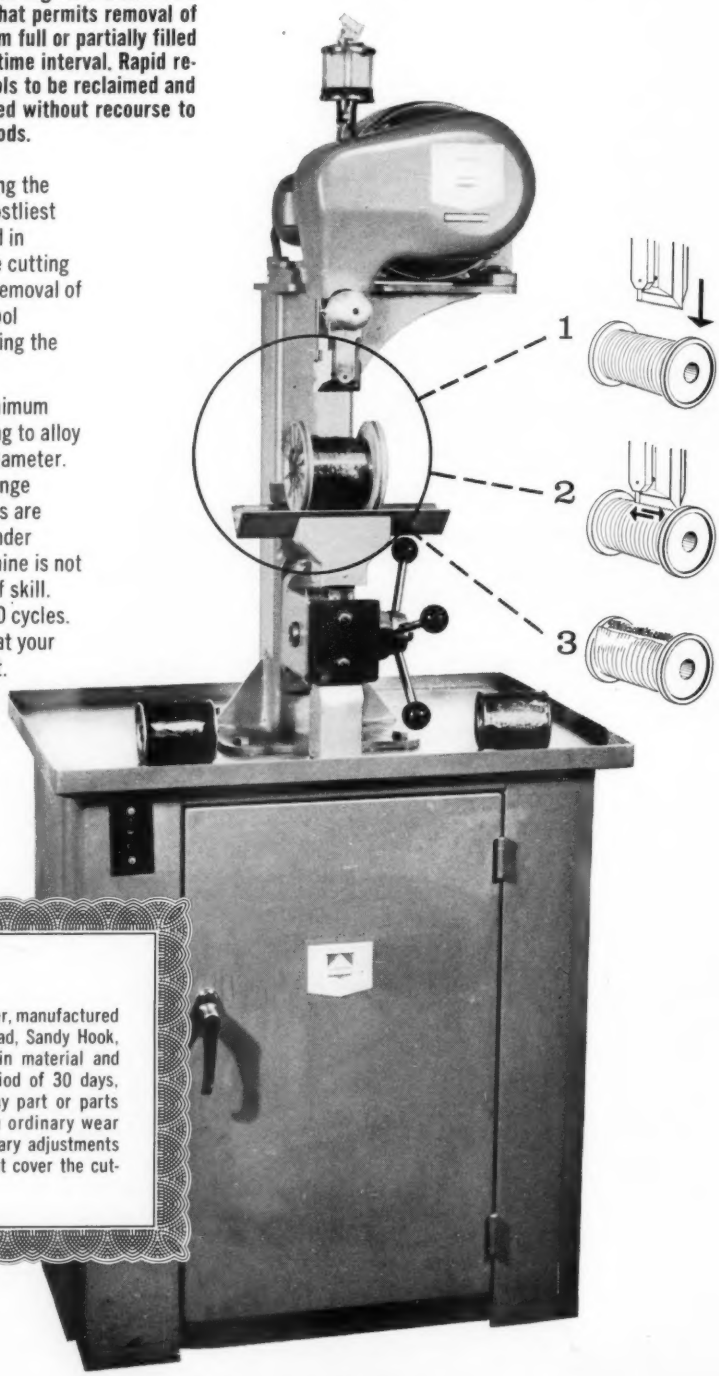
OSCILLATING WIRE CUTTER

SOLVES ONE OF THE COSTLIEST PROBLEMS IN THE INDUSTRY

The Watkins Oscillating Wire Cutter is a unique machine that permits removal of all wire alloys from full or partially filled spools in a short time interval. Rapid removal allows spools to be reclaimed and wire to be salvaged without recourse to costly hand methods.

Some of the largest companies in the country are using the Watkins Oscillating Wire Cutter to solve one of the costliest problems in the industry. Simple in design and rugged in construction, the Oscillating Wire Cutter has a unique cutting principle that shears wire turns on the spool, allows removal of the wire in seconds. Removal of the wire from the spool permits wire to be properly identified — thus increasing the scrap value and producing great savings.

The Standard machine, Model A, has a range from minimum diameter .0004" to maximum diameter .018" according to alloy and will handle spools from the smallest used to 8" diameter. The Heavy Duty model will handle spools up to 16" flange diameter, and wire diameter up to .050". Cutter blades are specially hardened and ground for good service life under reasonable care. The method of operation of the machine is not difficult to learn and does not require a high degree of skill. Electrical requirements are 220/440 volts, 3 phase, 60 cycles. The Standard machine is available for demonstration at your plant, within a reasonable distance, upon your request.



WARRANTY

We guarantee the Oscillating Wire Cutter, manufactured by R. S. Watkins & Sons, Inc., Glen Road, Sandy Hook, Connecticut, to be free from defects in material and workmanship. During the warranty period of 30 days, we agree to replace free of charge any part or parts which may become defective through ordinary wear and/or to advise regarding any necessary adjustments without charge. This guarantee does not cover the cutter blades.

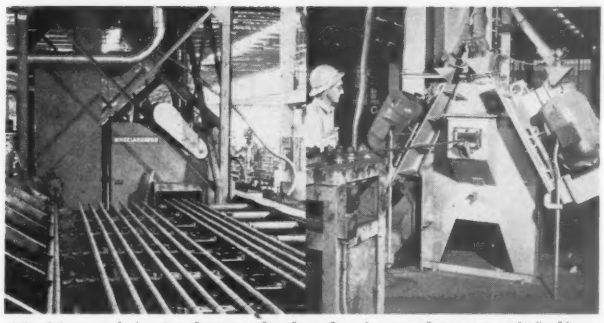
R S WIRE MACHINES

R. S. WATKINS & SONS, INC.

Address inquiries to:

H. D. WATKINS Manufacturers Representative
Box 385 Hatboro, Penna.

experience: vital ingredient of Wheelabrator's® success in wire descaling



Machine at left simultaneously descales four rods up to 4½" diam. Machine at right illustrates typical single-strand wire descaling cabinet.

A demonstration of WHEELABRATOR'S

VITAL VALUES

In the mechanical descaling of rod and bar stock, Wheelabrator offers you the vital experience of scores of successful, profitable installations. Leading producers of wire and wire products are now enjoying the competitive advantage inherent in automated manufacturing methods and freedom from the problems associated with acid pickling, made possible by Wheelabrator abrasive blast descaling.

Rod can be straightened, cleaned, coated, drawn and cold-headed in one continuous, straight-line operation, in single or multiple strands, at speeds up to 600 fpm. Multiple handling of coils and bar stock through batch processing is eliminated. And, the minutely cupped surface produced by the Wheelabrator method provides better drawing characteristics, and improved adhesion of coatings.

To reduce your descaling costs, eliminate the pickle house and combine cleaning with manufacturing processes, investigate Wheelabrator airless blast descaling. Write for complete information.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR

WIRE ROD DESCALING

WHEELABRATOR CORPORATION, 389 S. Byrkit St., Mishawaka, Indiana, In Canada, WHEELABRATOR CORPORATION OF CANADA, LTD. 1901 Birchmount Rd. P.O. Box 490, Scarborough, Ontario

A subsidiary of Bell Intercontinental Corp.

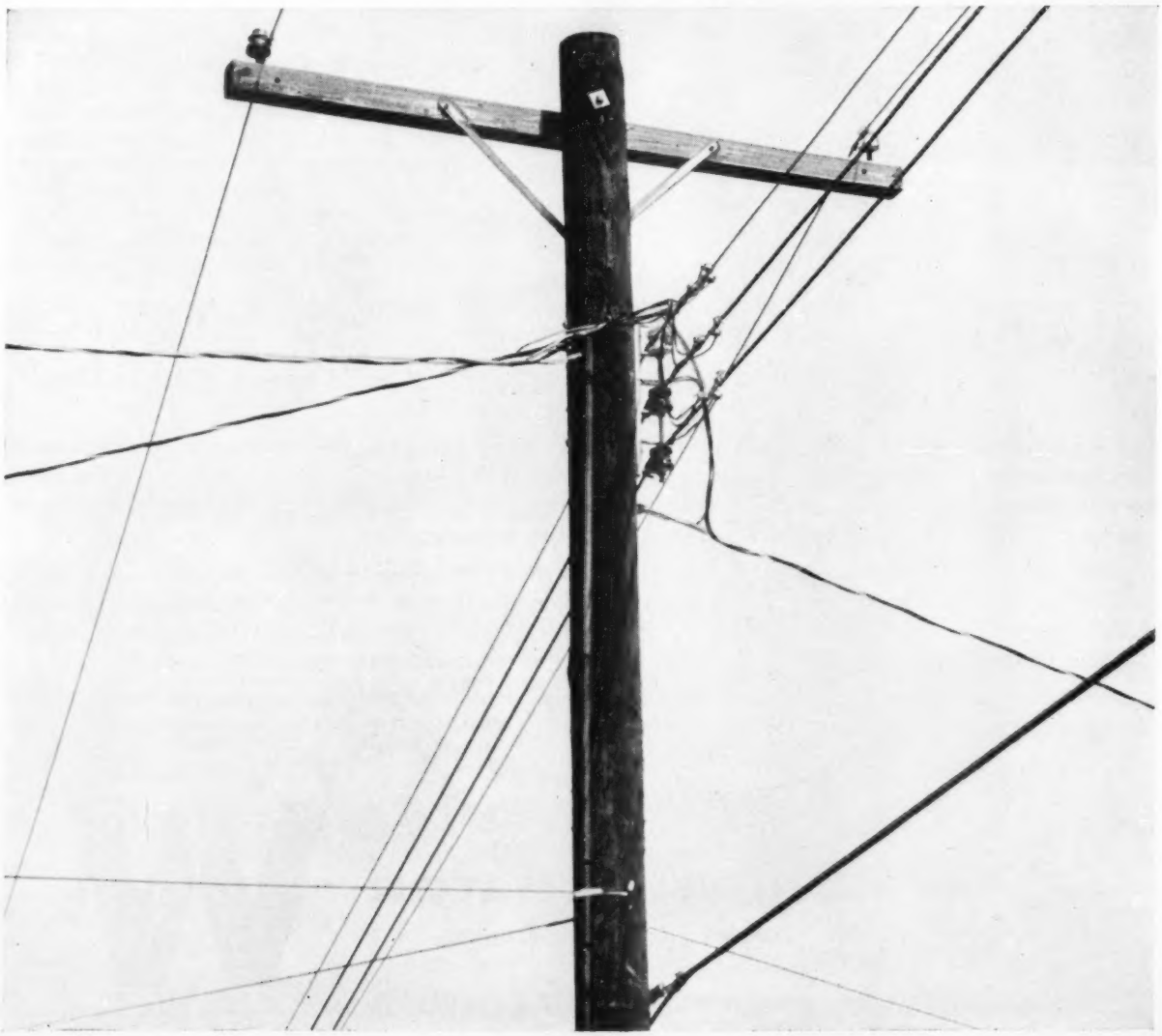
for the right number in power transmission line and drop wire insulation . . .

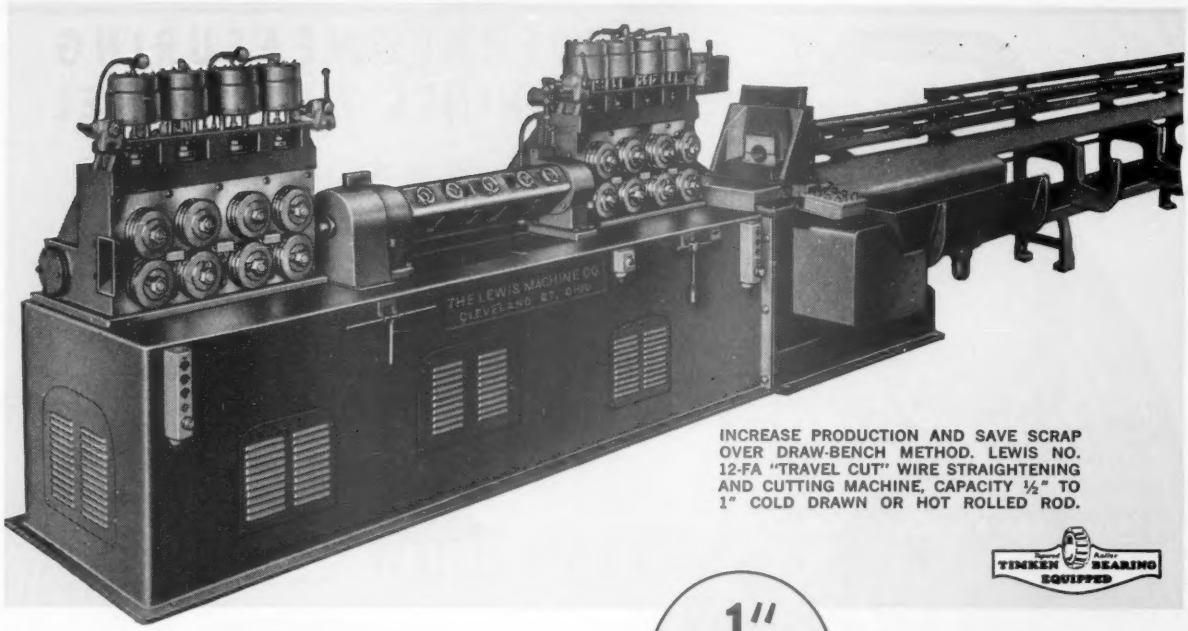
Monsanto Polyethylene compounds MPE 12 and MPE 11302 help make line and drop wire insulation economical to use and maintain because they impart superior weather-aging characteristics, good abrasion resistance, and resistance to fatigue, insuring long service life. MPE 12 and MPE 11302 contribute to excellent appearance—smooth surface, good gloss, and excellent carbon black dispersion.

Both offer fast extrusion rates. You can be sure of product uniformity because of Monsanto blend to blend uniformity. These resins impart good physical and electrical properties, meeting all applicable A.S.A. and IPCEA specifications.

Monsanto Polyethylene formulations are based on long experience in supplying the specialized needs of the Wire and Cable Industry. MPE 12 and MPE 11302 are but two in Monsanto's range of polyethylene resins developed for wire insulation. For more information, write to Monsanto Chemical Company, Plastics Division, Room 827, Springfield 2, Mass.

Monsanto®





INCREASE PRODUCTION AND SAVE SCRAP OVER DRAW-BENCH METHOD. LEWIS NO. 12-FA "TRAVEL CUT" WIRE STRAIGHTENING AND CUTTING MACHINE, CAPACITY ½" TO 1" COLD DRAWN OR HOT ROLLED ROD.

TIMKEN BEARING EQUIPPED

Now...straighten and cut 1" dia. rod FROM COILS at speeds up to 350 fpm.

HERE'S WHY IT CAN BE DONE

CUT-OFF Flying Shear Type. Pure crank motion for both cutting and traveling permitting high speeds with minimum shock.

ROTARY ARBOR Two-speed with dual-center straightening dies for faster, more accurate straightening over a wide range.

ROLL HOUSINGS Dual-range pushbutton operated pneumatic feed pressure for exact feed control and coil end pull-through without twisting.

LENGTH GAUGING Light pressure on electric trip switch actuates air clutch. Wire is gauged and released with positive moving mechanism . . . springs and latches have been eliminated.

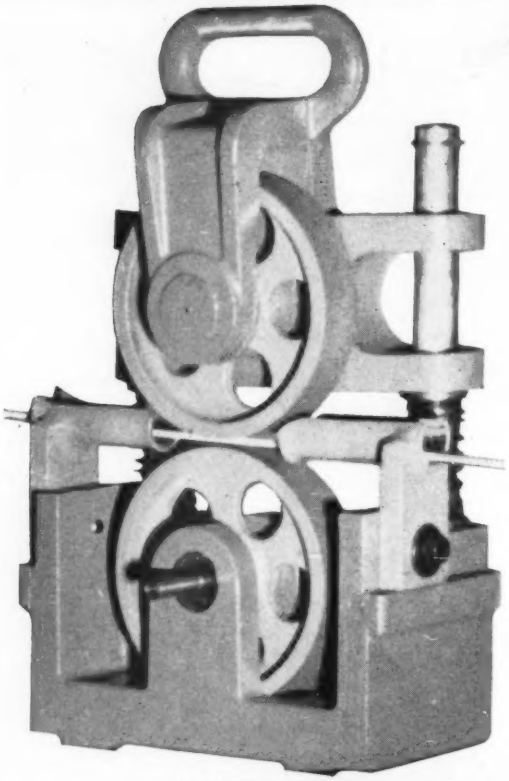
TRANSMISSION Positive sliding-gear type with eight feed speeds — 115 to 350 FPM.

Write for Brochure. Other models available to handle rounds from .012" to 1" dia. Shapes from 1/16 to 5/8" square, hex and flats.

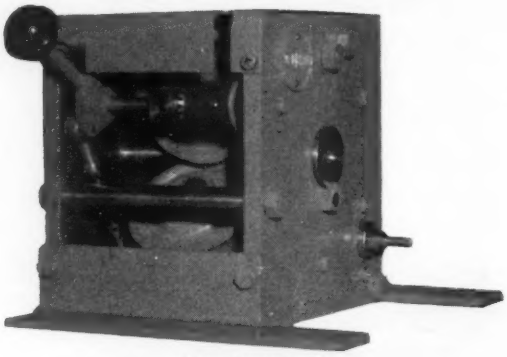
THE LEWIS MACHINE COMPANY
A DIVISION OF CURTIS MFG. CO.
3441 EAST 76TH STREET • CLEVELAND 27, OHIO

FEDERAL MEASURING MACHINES 2 or 3 WHEEL

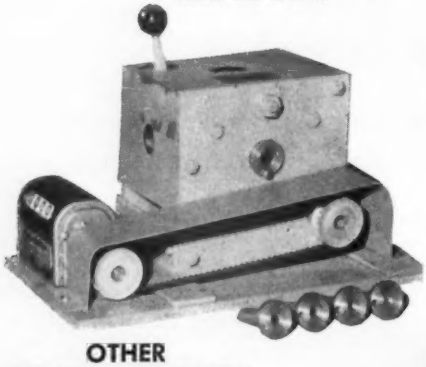
FROM 1/64 to 4" WIRE DIAMETER



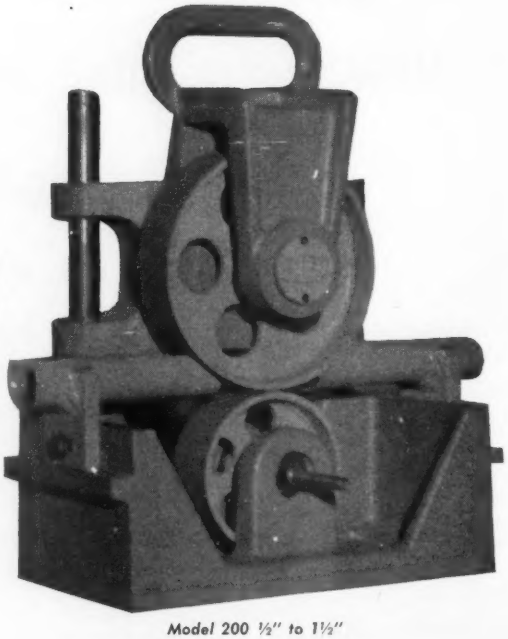
Model 100 ⅛ to ½"



Model H1 ⅛ to 1"



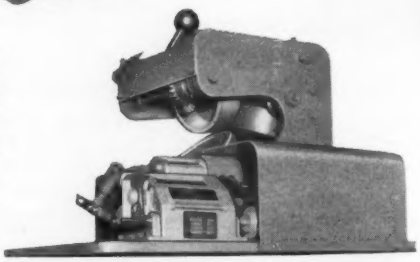
At left: Model H — 3-wheel measuring machine for fine wires — single or multiple conductors from 1/64" to ⅜" in diameter.



Model 200 ½" to 1½"

OTHER FEDERAL PRODUCTS

PAY-OFFS • TAKE-UPS CAPSTANS • PAY-OFF PAKS • COLLAPSIBLE COILING REELS • COILING MACHINES • PLANETARY CABLERS • PRE-HEATERS



Model H2 ½" to 2"

AND TEST EQUIPMENT

SPARK TESTERS • HI-POT TESTERS

AC-DC — ELECTRONIC

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WIRE MACHINERY • TESTING EQUIPMENT

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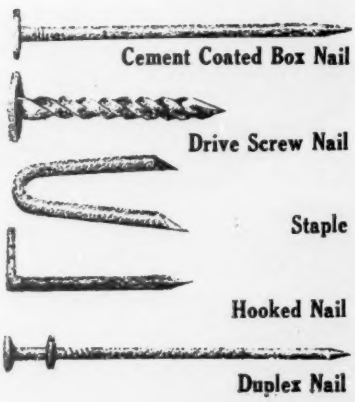
QUALITY WIRE RODS AND WIRE PRODUCTS

Wire rods in all gauges, finishes, tempers and analyses, and wire products of every description, including all kinds of nail, regular and special, to your specifications . . . specify YAWATA to fill your needs.



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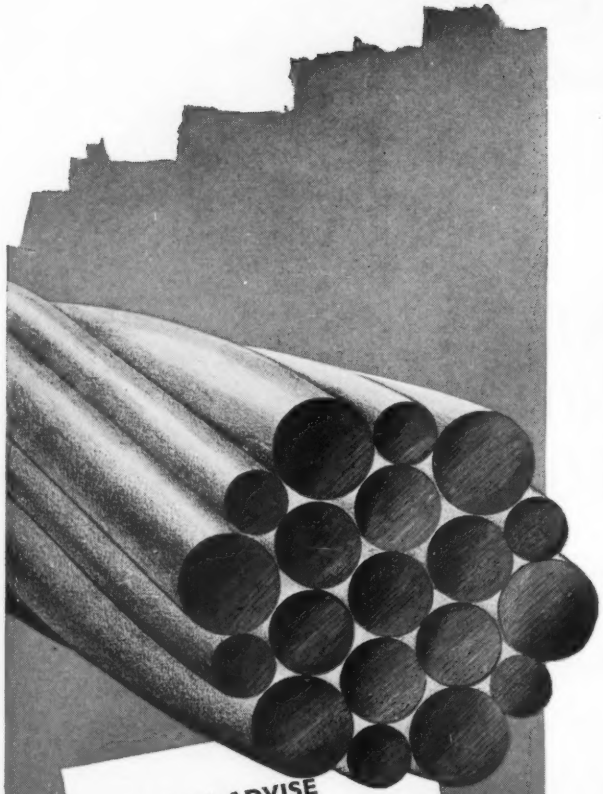
EUROPEAN OFFICE: Immermann Strasse 15, Duesseldorf, West Germany
Tel: 10463 Cable Address: YAWATASTEEL DUESSELDORF



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FOR LARGE STRANDS

LARGE STRANDS

for prestressed concrete

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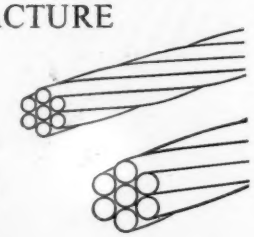
WE ALSO MANUFACTURE

SMALL STRANDS



and plain, indented or crimped wires

RYLANDS

Brothers Limited

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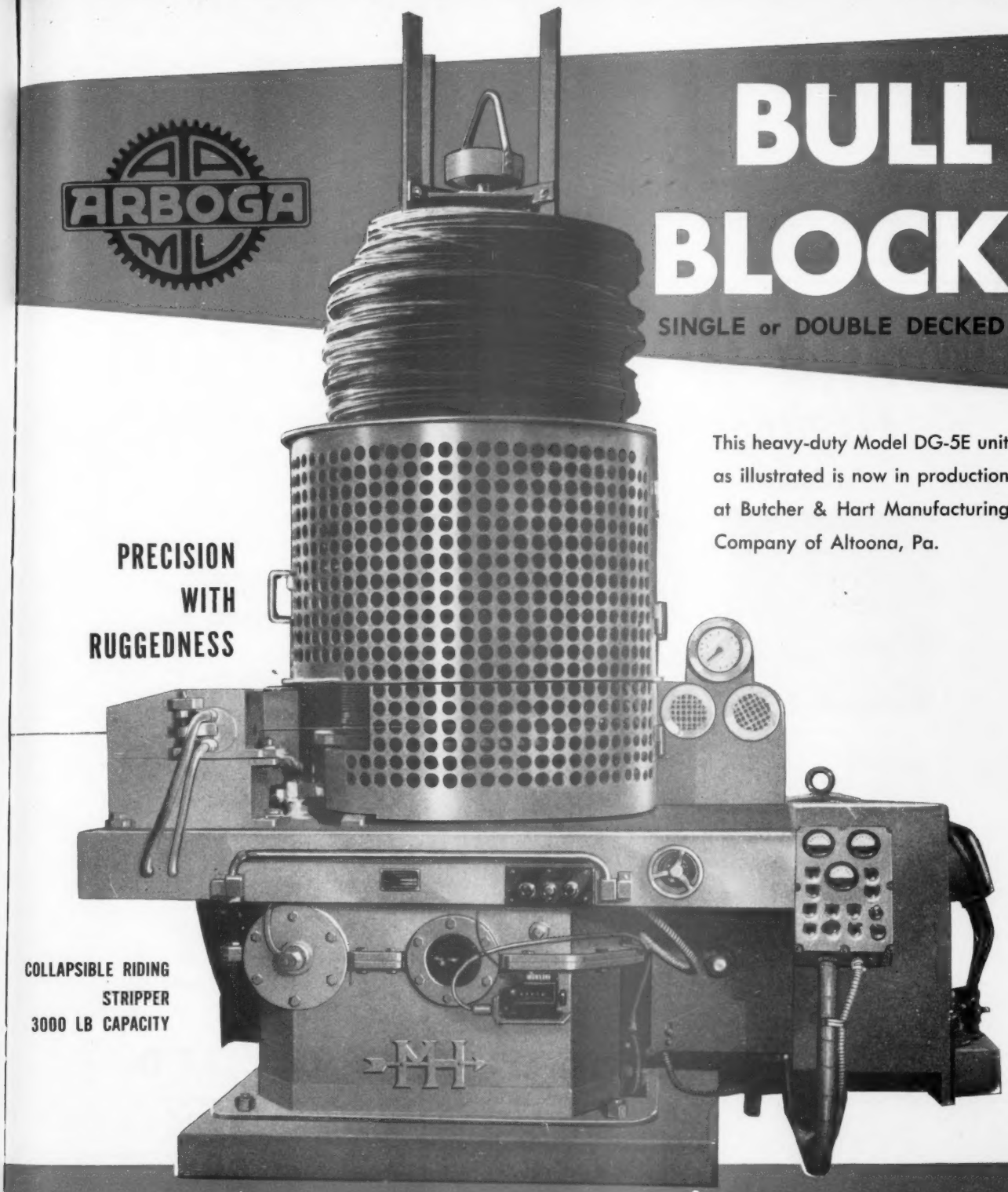
BULL BLOCKS

SINGLE or DOUBLE DECKED



This heavy-duty Model DG-5E unit as illustrated is now in production at Butcher & Hart Manufacturing Company of Altoona, Pa.

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COLLAPSIBLE RIDING STRIPPER
3000 LB CAPACITY

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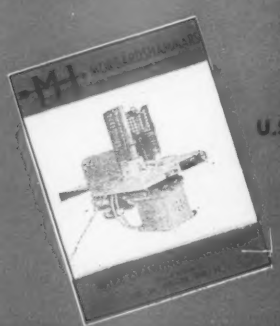

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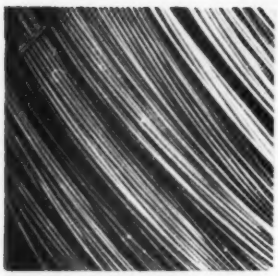
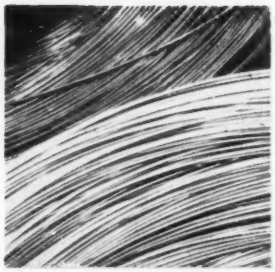
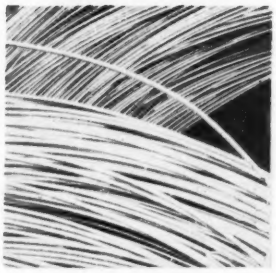
19002 LOMOND BLVD.
CLEVELAND 22, OHIO
TELEPHONE:
WYoming 1-5830

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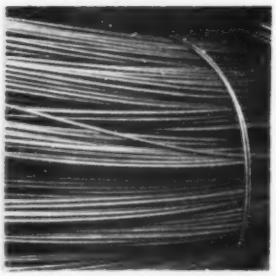

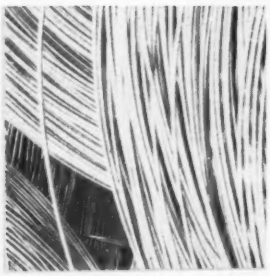
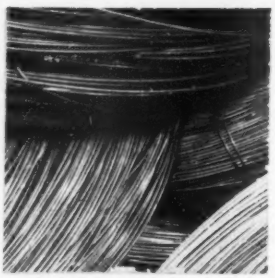

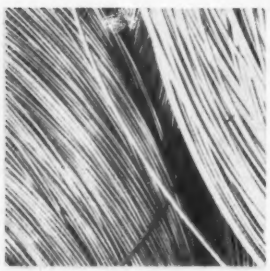

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for mild steel mesh in sheets	Wire 0.12—0.39 inch dia., width 147 inch.
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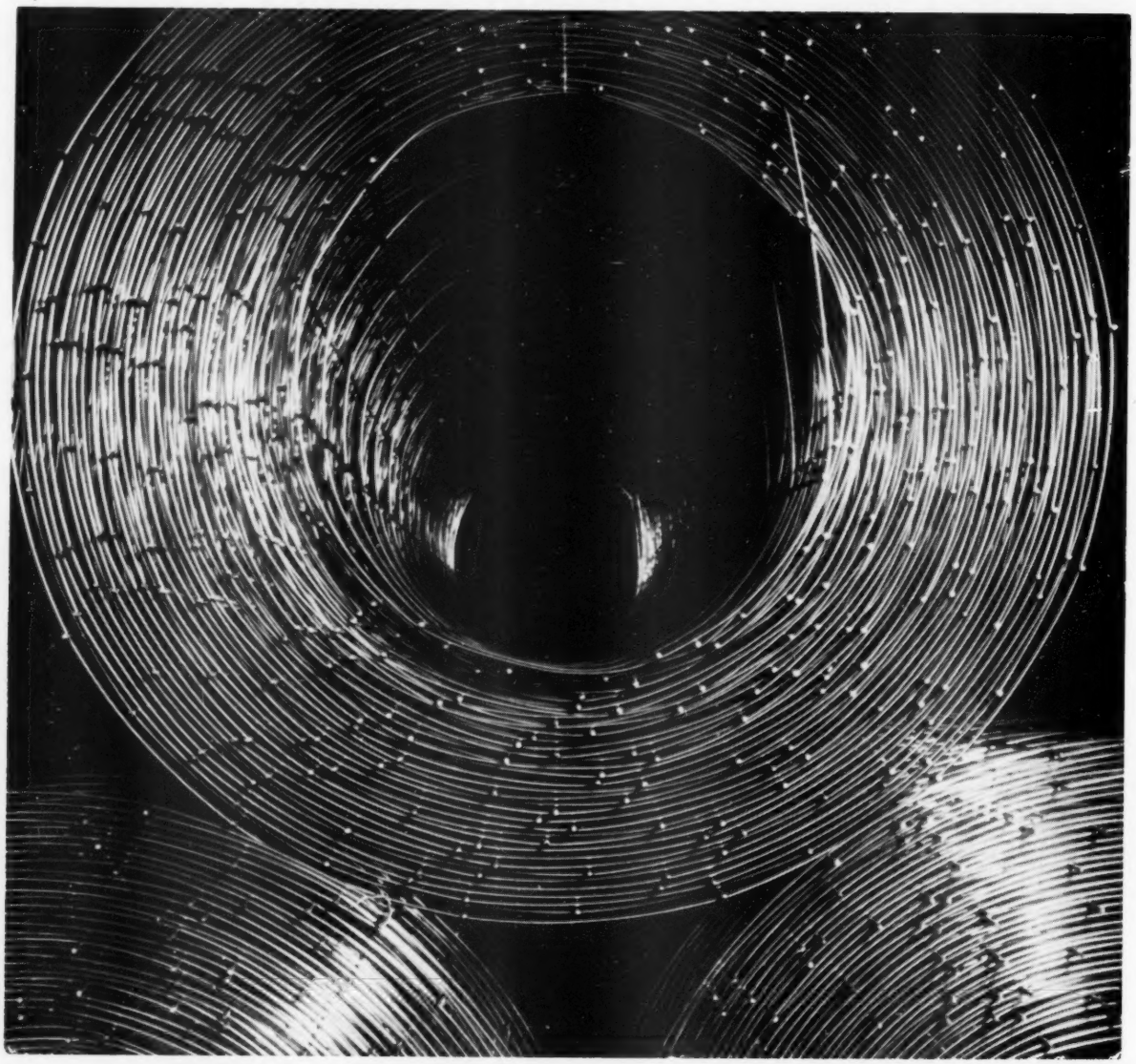

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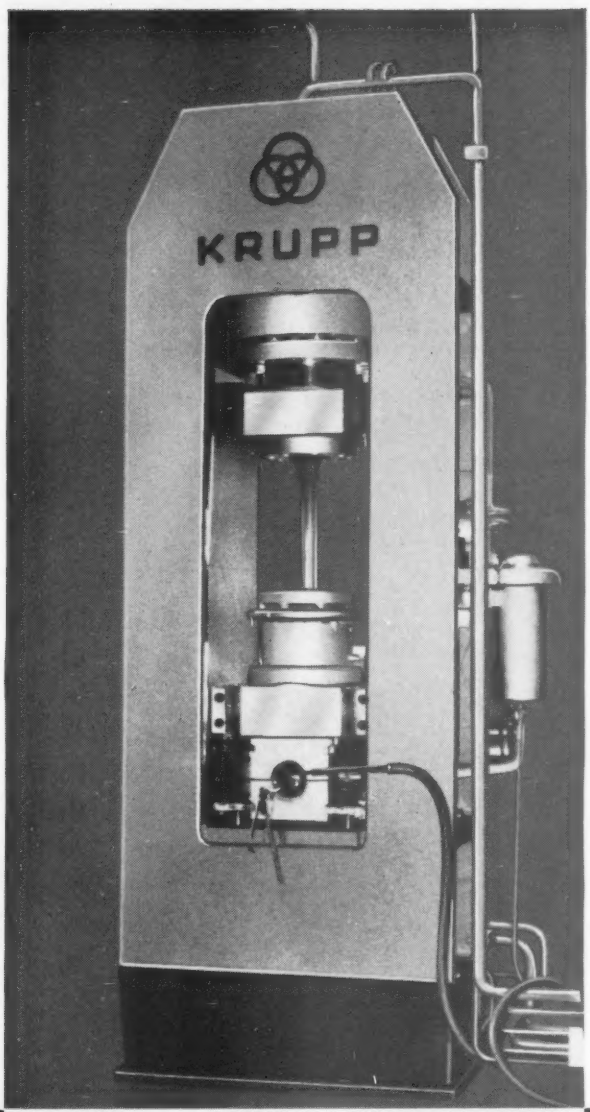

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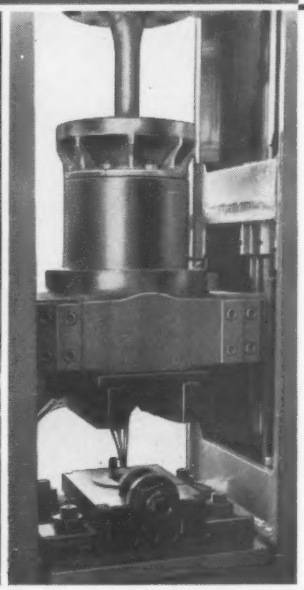

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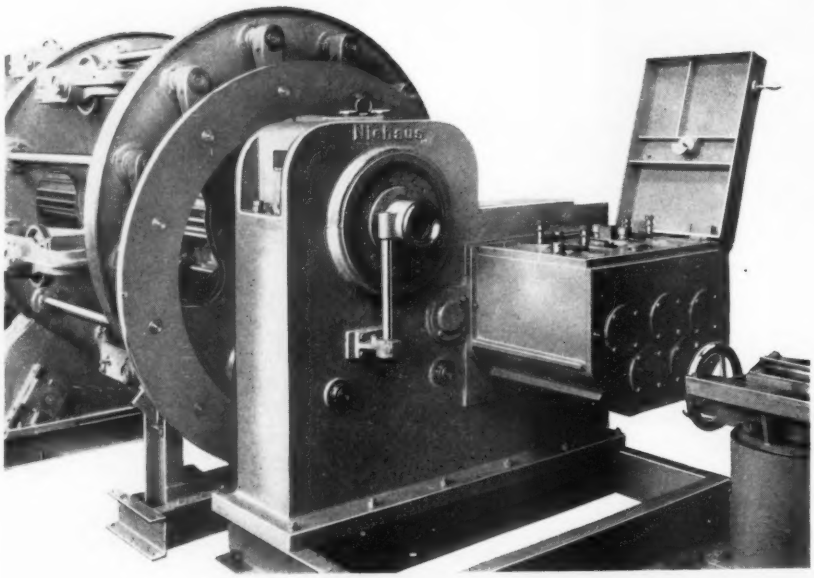

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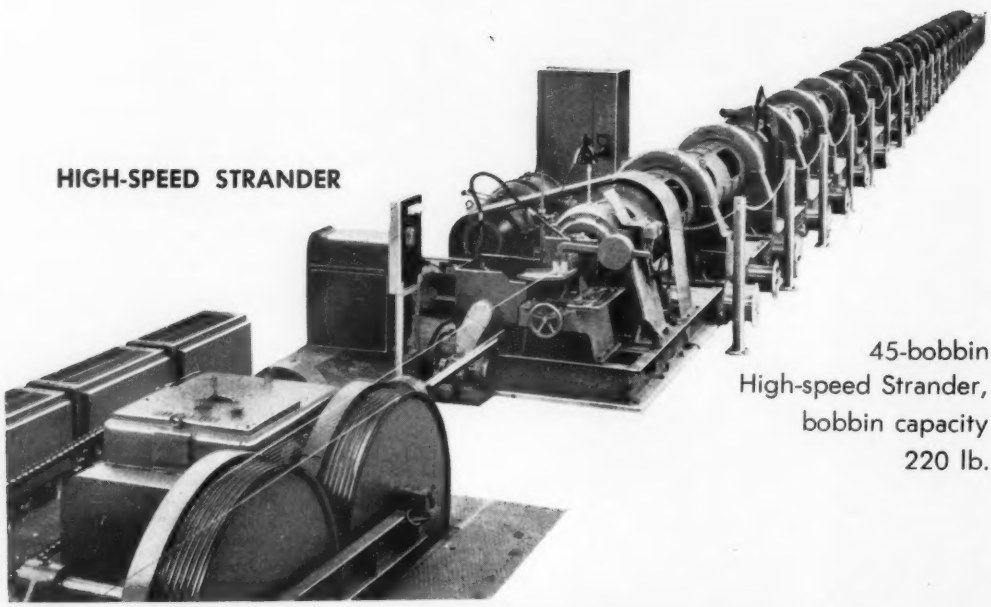

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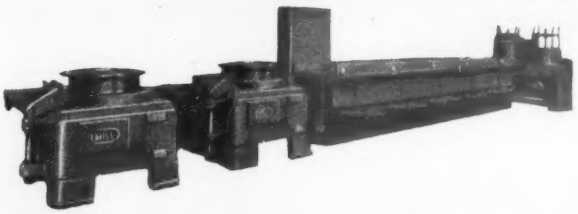

MULTIPLE STRAIGHT-LINE WIRE DRAWING MACHINE, Type MV 25, max. inlet dia. 8 mm. (hard steel), 12 mm. (mild steel), 14 mm. (copper wire).

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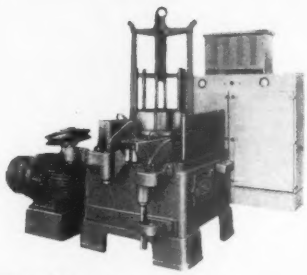

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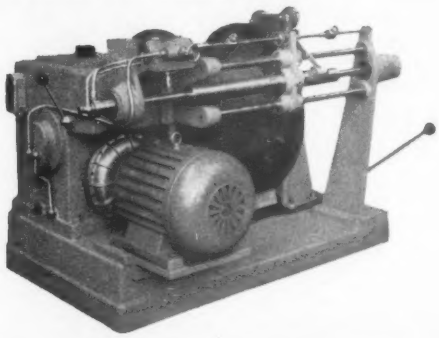

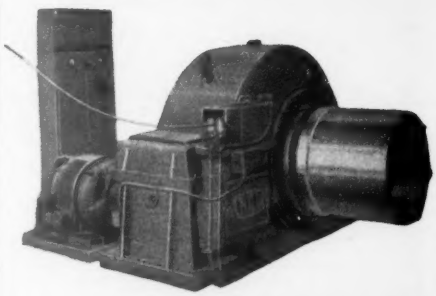

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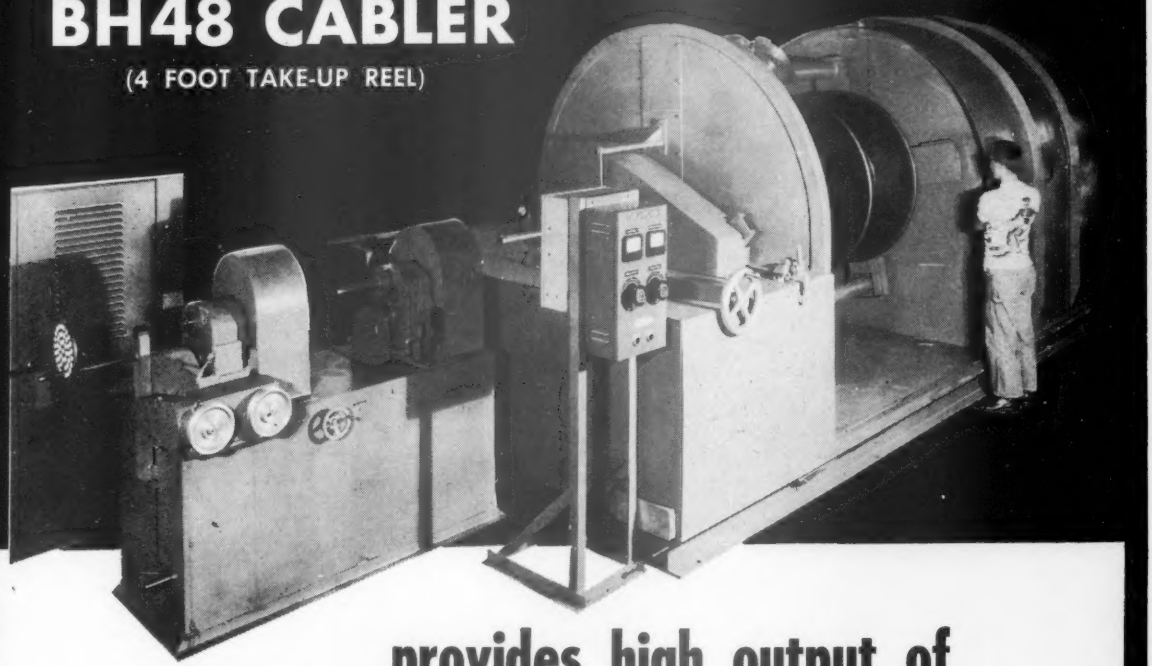

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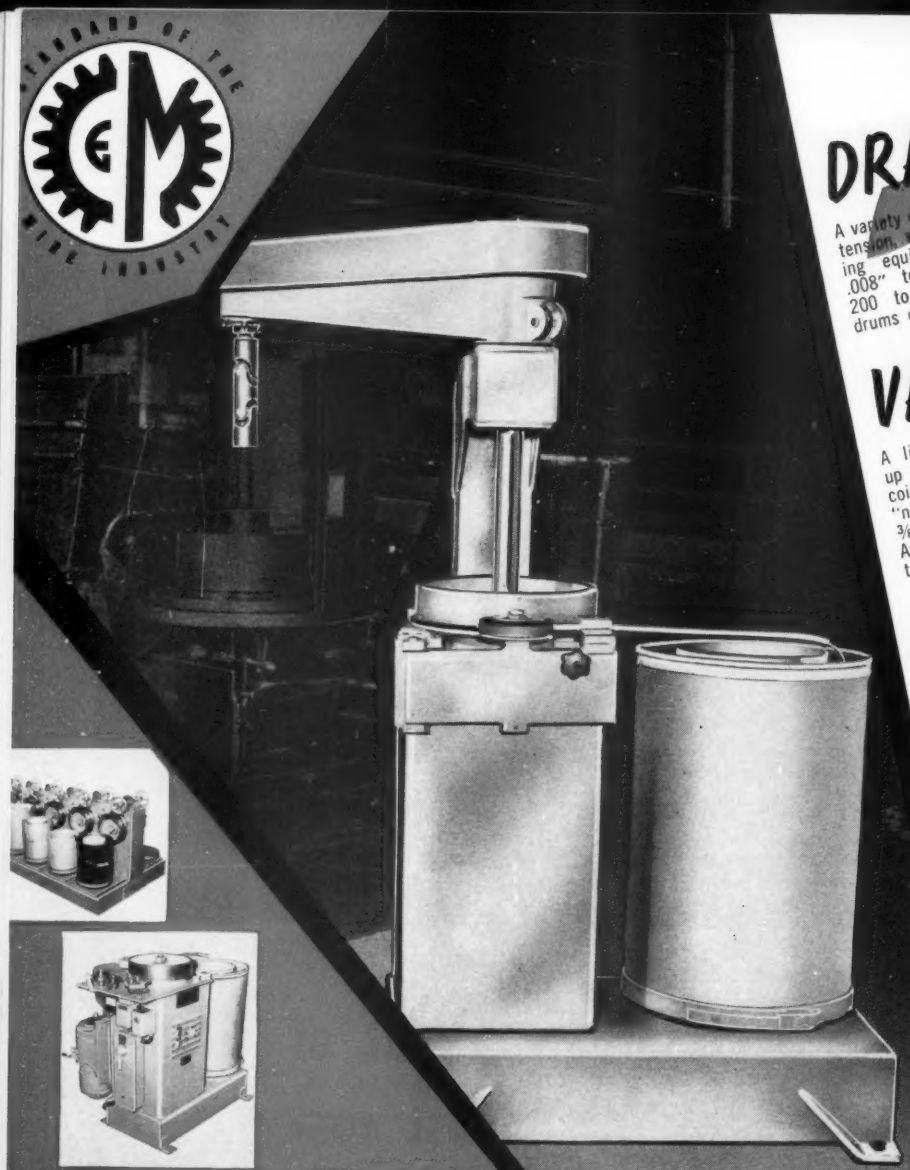

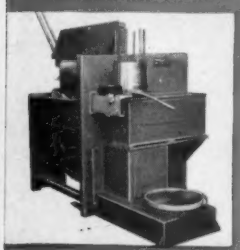

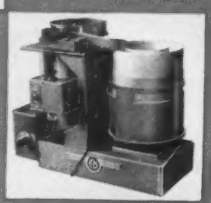

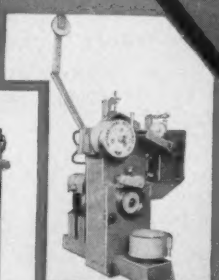

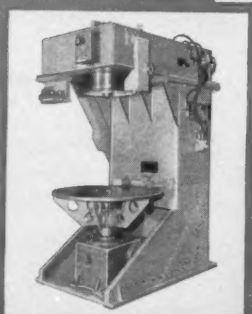

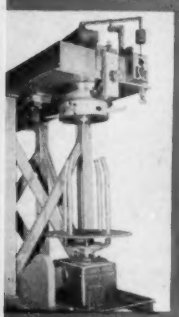

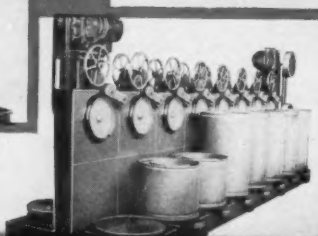

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The Wire Outlook

Much talk is going the rounds to the effect that recovery is not proceeding at as fast a pace as expected. The overall business pattern is showing considerable improvement, although there are spots in which much is left to be desired, among them the wire industry.

Accounting heavily for the increase in the gross national product is the activity of the automotive industry, which is producing and selling more cars than last year and for which an increasing demand is anticipated as the 1962 model year progresses.

The gross national product, the monetary value of all goods and services in the country, increased by 15 billion dollars by the end of the second quarter, but only added another 10 billion by the close of the third quarter. While an advance was noted, it was less than the forecasters expected for the early fall months, which gave occasion for doubt as to how vigorously the economy was growing. However, auto strikes were the principal reason for fall-off. The GNP is expected to stand at around 565 billion dollars by the end of the year.

Personal income is on the up-grade and has risen faster than spending, evidencing a reluctance on the part of the public to go further into debt on installment buying. People will have about $25 billion more to spend or save this year than last, and informed opinion is that spending will rise for most consumer products, principally for autos, household equipment and other durable goods. Economists are banking on public spending to keep the wheels of industry turning. Government spending should account for a considerable amount of increased business. $81.5 billion is budgeted for the current fiscal year and $92 billion for the next.

Inventories, mostly for raw materials for manufacturing plants, is building up, largely just keeping pace with increased sales. Total inventories rose by 600,000 million dollars in September to 92 billions. In the three preceding months inventories rose by 1.2 billions.

Building construction, principally for houses, is tapering off seasonably, but the outlook for 1962 is considered good, so far as now can be seen.

Employment and unemployment statistics are fairly static, except for normal seasonal fluctuations. About one million persons fewer are employed now than five years ago, with the total, including many who should not be included in the estimates, standing at a little under 7 percent of the employed. Around 700,000 persons are said to have been unemployed for over six months.

A factor that should bear long-range fruit for the economy is the huge sums allocated for research. This year some 14 billions are being spent for this, which will be upped by another billion in 1962, 5.5 billion of which will be spent by industry. In 1950 only 3 billion was expended for research.

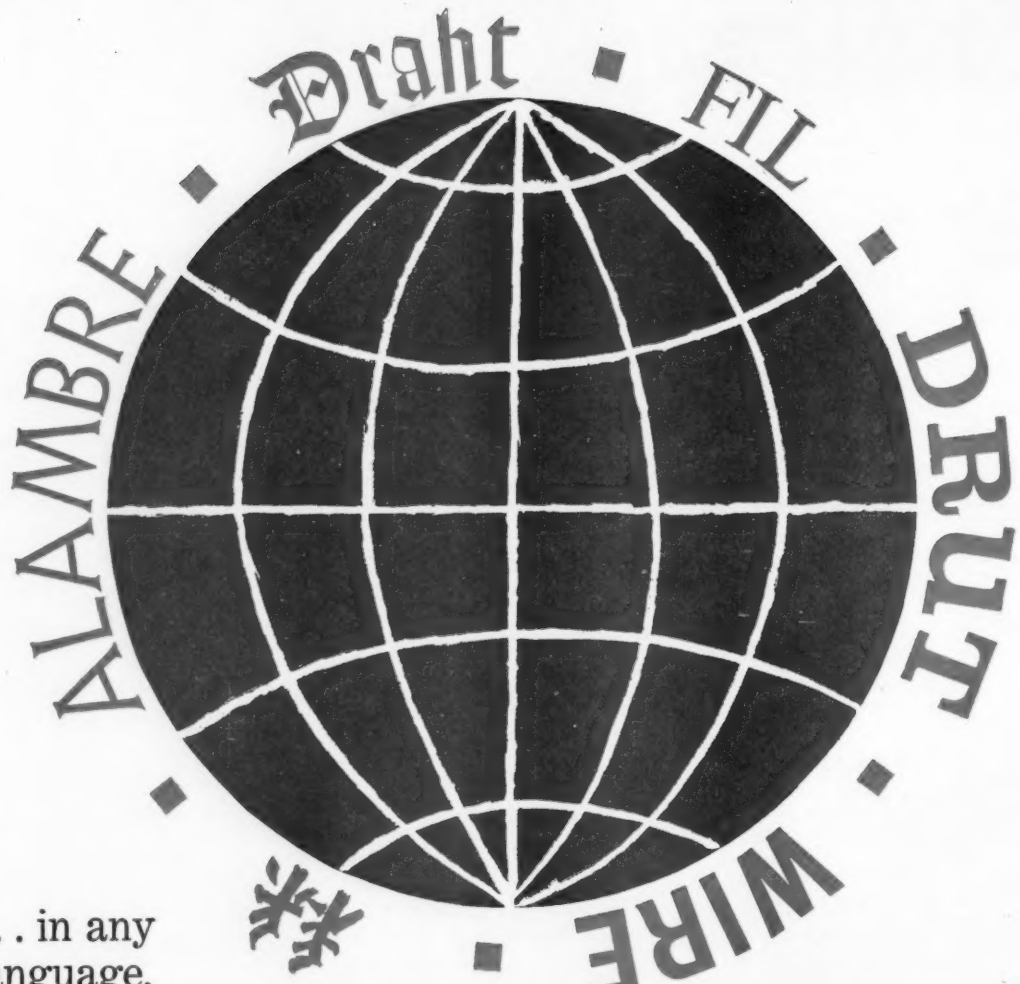
Steel wire mill orders rose in October, but not enough to tax capacity. There is little advance buying. Merchant wire products through the winter will be quiet and manufacturers' wire can be delivered on around a month's notice. Consumption definitely is on the increase. Good tonnages of reinforcing bar are being shipped.

Wire and cable shipments have risen about 10% after the Summer fall-off, which is considered encouraging. Brass and copper mills are doing somewhat better, especially in view of a drop of about 10% in imports in the third quarter.

The President has asked the agencies to reduce their spending, tax depreciation reforms now are in the offing, and it is highly improbable that a nuclear war will develop.

While we may not regain the tempo of the second quarter soon, there is every reason that business will improve through the second half of 1962—and far beyond that time.

Edmund D. Sickels
EDITOR



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Vol. 36 DECEMBER, 1961 No. 12

A New Approach to Die Shop Operations

by Donald K. White
Foreman, Wire Mills
John A. Roebling's Sons Division
The Colorado Fuel & Iron Corporation
Trenton, New Jersey

There are very few subjects more controversial to wire men than the operation of the die shop, for here lies the very heart of the wire mill. I am here today not so much to question techniques, but to focus our thinking along the lines of cost reduction and its relation to the die shop. Perhaps this work will serve as a source of encouragement and that thoughts and ideas may be forthcoming for new work in this line.

* * *

We can't lose sight of one important fact of the business world. Foreign imports have long ceased to be just intense competition and have now moved into the realm of actually forcing domestic producers to discontinue manufacturing certain commodities and, in some cases, have even forced doors to close permanently. With the low carbon mills discontinuing production of barbed wire, nail wire, fence wire and other such low profit lines, they are now moving into the high carbon field to compete with the high carbon specialty mills for their "bread and butter" trade. It can easily be seen that this condition doesn't affect just one element or one group of producers, instead it spans the industry for all to face.

Donald K. White

This paper was presented at the Annual Convention of The Wire Association on October 25, 1961, at French Lick, Indiana.

Mr. White graduated in 1951 from the Worcester Polytechnic Institute with a degree of B.S. in Mechanical Engineering, and joined the Roebling organization in July of the same year as a foreman in the Steel Wire Division. He has worked in most of the departments in the wire mills and currently is in charge of the Annealing Department and the Die Shops.

* * *

Generally the largest single item on a monthly expense sheet is labor and it is here in this category that effecting substantial savings can be most rewarding by reorganizing, revamping, reassigning duties to use more efficiently the hours for which labor is being compensated. Inherent idle time must be completely stripped from all jobs. To settle for anything less is to compromise with the over-all efficiency of the organization, something which, in these critical times, can spell complete disaster.

* * *

The Steel Wire Mills of the John A. Roebling's Sons Division of C.F.&I. has long recognized this matter to be an inescapable truth from which there can be no deviation. Labor is far too expensive to squander on inefficient and low return operations.

* * *

The redevelopment program has been going on continuously for the last fifteen (15) years. New wire drawing equipment, new patenting and cleaning lines, new spoolers and take-up equipment, new testing and bundling equipment, renovation of existing equipment all geared to accomplish one goal — the reduction of labor cost per unit item.

* * *

It was becoming obvious that the efficiency of the die shops

could be improved. Die makers were enjoying a degree of freedom not shared by the wire drawers on the floor. With the introduction of new equipment and changes in products in the mill, free time had accumulated that should be utilized to benefit the corporation. A study was made to review the complete process of refinishing dies so only necessary work would be performed and all idle time would be eliminated.

* * *

Before delving too far into the subject, it may be well to take a moment to review the nomenclature associated with wire drawing dies so we will be familiar with the terms. The sketch (see figure 1) illustrates the following features:

a. case
b. nib
c. bell
d. entrance angle
e. approach angle
f. bearing
g. back relief

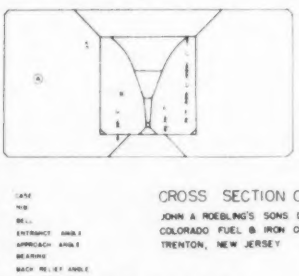


Figure 1 — Cross Section of Die. * * *

The nib is mounted in a case which supports the tungsten carbide and protects it from sudden shock. There are several methods used to mount the carbide nib in the case. Generally an AISI C-1113 or C-1213 steel is used, however, AISI 4340 was popular up to recently and, in some cases, brass has been used. The nib is simply pressed into the case so it will be firmly anchored. Past practice called for the nibs to be forged into the case. This feature is still available but generally at a premium cost.

* * *

Dies are available in a series of standard case sizes and it has been our experience that the nibs should be mounted in the largest size case possible to promote a more favorable heat transfer to the coolant in the die box. Most attempts to adapt a small case with a bushing to a larger size die box will not offer sufficient cooling for the die.

* * *

Tungsten carbide nibs are available in a series of standard sizes as outlined in the following chart:

	Nib Diameter	Nib Height	Standard Cored Hole Size	Maximum Recommended Hole Size
R-1	.325	.240	.004 - .010 - .015 - .025	.106
R-2	.325	.330	.004 - .010 - .015 - .025 - .040	.128
R-3	.460	.380	.015 - .025 - .040 - .055	.182
R-4	.510	.460	.025 - .040 - .055 - .085	.230
R-5	.635	.610	.025 - .040 - .055 - .085 - .120	.280
R-6	.720	.710	.040 - .055 - .085 - .120 - .150 - .200	.425
R-7	.775	.775	.230 - .290 - .350	.425
R-8	1.000	.820	.230 - .290 - .350 - .420	.516
R-9	1.187	.820	.350 - .420 - .480 - .545 - .605	.687

There are some cases where it is most practical to procure cored dies in sizes other than standard. For example, we find it very practical to procure rough cored dies at a meeting point diameter of 0.110 inch diameter to satisfy a large demand for 0.115 inch diameter dies. R-5 dies are procured rough cored with a sixteen (16) degree approach angle at a meeting point diameter of 0.150 inch diameter. A sufficient number of this size die was not coming into position rapidly enough to satisfy the demand. Instead of roughing from a size twenty or thirty thousandths away, the span is bridged with a supply of specially cored dies.

* * *

Specially cored dies can be economical and help reduce die room costs. Roebling is using an R-2 nib rough cored at a diameter of 0.005 inch with a preformed back relief mounted in a case 1½ inches in diameter and ¾ inch high. Six to eight cuts can be made before reaching a diameter of near 0.020 inch. The die is now in position to be treated exactly like an R-3 die rough cored at 0.025 inch diameter mounted in the same size case.

* * *

The standard shape or contour is important and should be preserved with each recutting of the die. These standards will vary throughout the industry to meet the specific local conditions.

* * *

At Roebling we are concentrating on high carbon materials and generally follow this practice.

Size Range	Length of Bearing (Percent)	Approach Angle (Included Angle Degrees)
0.050" - 0.134"	30%	12°
0.135" - 0.209"	30%	16°
0.210" - 0.304"	30%	18°
0.305" - up	20%	18°

Back Angle is 90° included angle in all cases.

* * *

With low carbon material, the approach angle will generally be increased two degrees although much of the low carbon material drawn is done with the standard dies.

* * *

Bearing lengths are usually between twenty and thirty percent with dies in the larger sizes having the shorter bearing lengths. As a general rule, material with a soft metal coating e.g. zinc, copper and all low carbon materials draw better with short bearing dies.

* * *

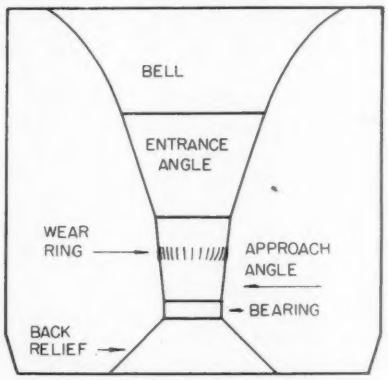
With the refinishing of all dies, it is necessary to blend together the intersection of the surface generated by the bell, entrance angle, and approach angle to provide a smooth continuous surface so the wire and the lubricant can enter the die with a minimum of restriction. The intersection of the approach angle and the bearing is usually broken or rounded off although this is not as important in high carbon work as with other materials. The same holds true for the bearing and back relief although this is usually accomplished when the die is sized from the back. Breaking this intersection helps to prevent chipping and flaking of the carbide nib.

* * *

For many years there has been a great aura of mystery surrounding the process of servicing dies. Actually it is a process employing just a few basic moves and sound judgment.

* * *

Generally a used die is returned to the die room with some degree of wear evident in the approach angle at the point the wire first strikes the die (see figure 2). This is the point where the wire changes its direction of flow to conform to the angle and it is here that a spot or wear ring will develop. The wear ring should be removed and this is accomplished by rotating and reciprocating a tapered pin into the approach angle, into which is flowing an abrasive mixture.



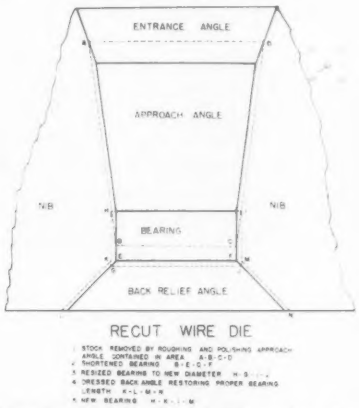
WEAR RING LOCATION

Figure 2 — Cross Section of Die with Wear Ring. * * * * * * * * *

Pressure is applied to the pin and the action chips out small particles of carbide. Worn pins are changed periodically and the process is continued until the desired amount of carbide is removed. By repeating the process with progressive grades of finer abrasives, it is possible to work the finish to various degrees of refinement.

* * *

When work is done on the approach angle (see figure 3). the bearing is shortened; it is advisable now to resize the die to a larger size. This is accomplished by reciprocating a straight pin into the die. Obviously the front end of the pin has to be tapered so the die will accept the pin, and with an application of appropriate abrasive the motion is continued until the pin just passes through the die.



RECUT WIRE DIE

1. STOCK REMOVED BY ROUGHING AND POLISHING APPROACH ANGLE CONTAINED IN AREA A-B-C-D
2. SHORTENED BEARING B-E-C-F
3. RESIZED BEARING TO NEW DIAMETER H-S-...
4. DRESSED BACK ANGLE RESTORING PROPER BEARING LENGTH K-L-M-N
5. NEW BEARING H-K-...-M

Figure 3 — Steps to Rework Die. * * *

These are the two basic actions, but there are also two resultant moves which have to be performed as a result of recutting the approach angle. A sharp intersection has developed between the approach angle and the entrance angle or bell. This should be ground off to preserve the smooth flow pattern. This may be manually ground off with a high speed hand grinder, using a diamond impregnated carbide tool. The back relief has also been shortened somewhat and should be restored by grinding. This may not have to be done with every resizing, but it is the most rapid method to reduce the bearing length.

* * *

The bearing length may be expressed as a pure distance in inches or as a percentage of the distance taken with respect to the diameter of the bore.

* * *

The bearing length is usually determined by a visual estimation although instruments are available which will accurately determine it. Usually an experienced die maker can produce a die with a reasonably accurate length of bearing.

* * *

Another technique is to work from the meeting point diameter each time. This method takes a little longer, but die makers will consistently produce dies with uniform bearing lengths. When a die is roughed to the point where all the bearing has been removed, the approach angle will intersect with the back relief. The diameter of this opening is termed the meeting point diameter.

* * *

Usually the problem is to make a die with these factors specified:

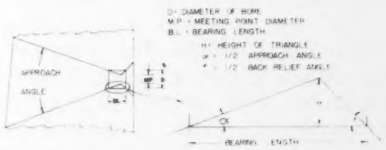
a. approach angle
b. diameter of bore
c. length of bearing

With these three factors known, the meeting point diameter may be determined.

* * *

Referring to the sketch (see figure 4), it should be obvious that the bore diameter is equal to the meeting point diameter plus 2h where h is the height of the triangle shown.

$$D = MP + 2h$$


D = DIAMETER OF BORE
MP = MEETING POINT DIAMETER
BL = BEARING LENGTH
H = HEIGHT OF TRIANGLE
α = 1/2 APPROACH ANGLE
β = 1/2 BACK RELIEF ANGLE
APPROACH ANGLE
BEARING LENGTH

DETERMINATION OF MEETING POINT DIAMETER FROM BEARING LENGTH

Figure 4 — Meeting Point Diameter Calculation.

The problem now becomes one of basic trigonometry where h must be determined with angle α angle β, and the bearing length a known factor.

* * *

Knowing the fundamental motions used to service a die, it is now necessary that they be assembled into the proper sequence and assigned so a die maker can efficiently service dies with maximum output. Quality standards should be established to which a die maker must subscribe and adhere. There is little sense to finish polish the bell, entrance angle, approach angle if it serves no purpose.

* * *

With due respect to our colleagues in this field, this is where opinions will sharply diverge. It is our opinion that dies should be made with a minimum amount of work. They should be made just a little better than that necessary to operate the mill. Anything beyond that is a waste of time and money. I don't mean to imply that accuracy should be sacrificed; nothing

could be further from my mind. I question only the degree of finish and its application to specific sections of the nib. The accuracy of the bore diameter must be preserved. The die maker must take little or no tolerance so it all may be passed on to the wire drawer.

* * *

With this information offered as a general introduction or frame of reference, one can now comprehend and evaluate the work which has been done at Roebling with the die shop.

* * *

The No. 1 Die Shop which supplies dies for the mill drawing finish sizes of 0.060 inch diameter wire and larger was selected to be changed first because of the more liberal tolerances permitted with the larger sizes. The shop was staffed with a standard size crew.

* * *

The die shop consisted of three (3) finishing stations, each equipped with three (3) semi-polishers, a sizing head, a hand grinder, and the required supplementary tools.

* * *

Two roughing stations were used: one using a ten (10) spindle rougher for roughing the smaller diameter dies and the other station using three (3) heavy duty single spindle roughers for the heavy stock removed from the large diameter dies.

* * *

The die distributor received all dies at his work station for preliminary cleaning and sorting. Cleaning equipment was limited to an electric wire brush and assorted hand probes and picks. He would issue all dies from the finish die cabinets.

* * *

Die finishers finished dies in a certain range. These ranges were divided so each finisher processed an equal number of dies thereby satisfying all demands made by the mill. The finisher inspected the dies returned by the mill in his size range to salvage as many as possible with a minimum investment of work. Dies with more serious defects were worked out on the semiautomatic polisher and then manually resized to a new diameter. Dies, which in the opinion of the die maker were beyond the practical physical limits of the polisher, were turned over to the rougher.

* * *

By practice the die maker satisfied the demands made on him by first processing dies which required the minimum amount of work to restore to condition. This returned a large number of dies to service rapidly, and he then serviced those dies which came back to him from the rougher and required the complete treatment. The demand made upon the die shop would fluctuate on a day to day basis, but enough flexibility existed so the die maker's size range was expanded and contracted to meet all the requirements.

* * *

All finishers were provided with a supply of various micron size diamond powder which they in turn mixed with olive oil to cut the tungsten carbide dies. The hand grinders were equipped with the standard diamond mounted wheels using a tungsten carbide matrix.

* * *

The die rougher conditioned all dies beyond the limits of the die finisher's semiautomatic polishers. These dies were roughed so the wear rings and the other defects were removed. The dies were then returned to the finishers for processing. In cases where shortages in a certain size range became acute, the rougher would rough stock dies so the finisher could fill the void. He would also rough dies in which the approach angle was enlarged.

* * *

The heavy duty single spindle roughers were charged with a mixture of kerosene and 200 grit abrasive. The charge was changed frequently to obtain the maximum production from the units.

* * *

The ten (10) spindle unit didn't have an abrasive system; instead 320 grit abrasive was mixed with oil and applied directly into the approach angle of the die.

* * *

A new plan was formulated from the study made in the die shop, so all dies would be serviced in a manner that would satisfy the demands made by the great bulk of material being processed through the mill. Occasionally some orders would need dies requiring additional refinement, but by and large this is a small enough percentage that these dies can be made as required. It was felt that it would be wiser to operate in this manner rather than invest the additional time with each die finishing to the "ultimate" on the chance that it would be needed. This incremental amount of time will compound itself into a sizeable amount in a relatively short period of time.

* * *

The reconditioning or servicing of dies was divided into two

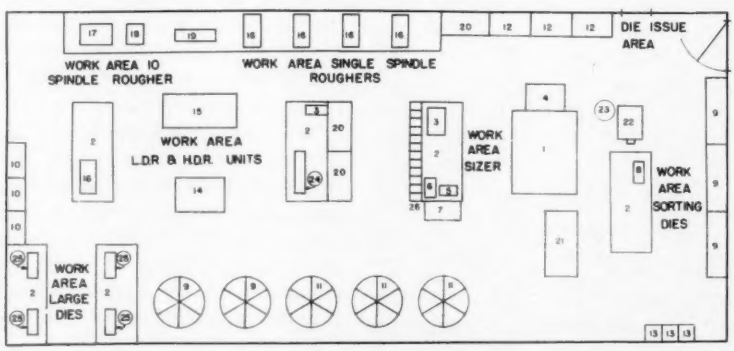


Figure 5 — Die Room Layout.

* * * * * * * * * * * * *

general operations — (a) working of the approach angle and the blending of the resulting sharp intersections and (b) sizing and marking the dies. Several new pieces of equipment were procured to effect this modification, of which two served as the nucleus to perform the two basic functions. The sizing would be performed on a multihead die sizing machine. For the companion piece to perform the roughing and polishing, a machine builder was approached with some basic ideas and conditions which culminated with our acquisition of two multihead roughing machines.

* * *

Using these units as the center of the two work areas, the die room was laid out to facilitate a smooth work flow insofar as the geography of the building permitted (see figure 5).

* * *

The revised staff required only about one half that of the former crew. One die maker on the day shift (see figure 6) makes up all dies over 0.250 inch diameter and dies requiring additional polishing for drawing bright finished wire. The other die makers operate the new equipment on a three-shift basis.

Figure 6 — Reworking Large Diameter Dies.

The two roughing machines are positioned facing each other and the die maker works between them. He also has the benefit of two benches facing each other adjacent to the roughing machines. The work bench is equipped with a set of plug gages and washing equipment.

* * *

The heavy duty machine (see figure 7) has 3-1/3 horsepower

Figure 7 — Three-Head Heavy Duty Roughing Machine.

heads with ½ inch chucks and is used to rough all dies from a diameter of 0.100 inch and up. Each head has an individual abrasive system charged with a mixture of abrasive grit size 220 and kerosene. The light duty machine (see figure 8) has 3-1/6 horsepower heads with ⅜ inch chucks. Two heads are charged with a mixture of 280 grit abrasive and kerosene and are used to rough all dies from a diameter of 0.050 inch to 0.100 inch. The third head is charged with a mixture of kerosene and 400 grit abrasive and is used to polish all dies being roughed on the other five heads.

Figure 8 — Three-Head Light Duty Roughing Machine.

A cycle for roughing dies has been developed which follows this general pattern. A die is mounted in the die holder. The roughing pin of appropriate length and angle is mounted in the chuck. The abrasive system is started and the flow regulated to the required rate. The head is lowered pneumatically so the roughing pin will just enter the die. The machine is started, and then the degree of cutting is regulated by the control wheel in front of each head. The timer is adjusted for the desired length of cycle, which will depend upon the diameter of the die and the amount of cutting to be performed. Toward the end of the cycle the machine is stopped long enough to raise the head, replace the roughing pin with a new one, and lower the head to complete the cycle. At the completion of the cycle the head is raised; the completed die is removed from the holder; the next die is mounted in the holder; the head is lowered and the machine is started on the next die. The completed die is then washed, inspected, and placed in line for polishing. The polishing follows the procedure outlined above, except for an abbreviated length of cycle. At the completion of the cycle, the die is cleaned, inspected, dressed, plug gaged, and placed in the storage bins according to the meeting point diameter. The dressing consists of grinding a larger bell or blending the bell into the entrance and approach angles or enlarging the back angle.

* * *

In order to promote some uniform standards or techinques, certain basic principles were adopted. All dies are roughed to the meeting point diameter. Dies to be reserviced of the same diameter are processed or roughed for the same time cycle.

* * *

In most cases, the die will be completed at the end of the cycle provided, of course, that the die maker maintains the proper adjustments on the machine during the cycle and secondly that the abrasive mixture is up to proper strength. All dies which fail the inspection are started again for another full cycle.

* * *

The die maker works to fill size voids in the storage bin made by the demands of the sizer. Since dies won't wear alike, the precise amount of carbide which has to be removed can't be controlled, and the die maker will not necessarily get the exact die size desired. This will, however, generally balance itself out in the long run.

The abrasive system of each head should be observed periodically and proper make-up of abrasive and/or solvent should be made to compensate for the drag out. The systems eventually have to be completely cleaned, but this will vary with the type of abrasive, the number of dies and the amount of working each die received.

* * *

The die maker operating the die sizer has several different functions to perform. Of course, his primary job is to size dies, eliminating die shortages precipitated by the demand of the mill. Experience will dictate which shortages will require prompt attention. Operation of the die sizer is most efficient when long runs can be made.

* * *

The work area of the die sizer is laid out so the die maker works between a work bench and the die sizing machine. Lying adjacent to the sizer is the storage cabinet for the finished dies. Supply dies are procured from rotating storage racks (see figure 9) located between the work area of the two die makers.

Figure 9 — Rotating Storage Bins. * * *

Located on the work bench is a set of plug gages, an ultrasonic cleaner and filtered circulator used to clean dies contaminated with diamond compound. A small tool cabinet is located in close proximity with the sizer for storage of sizing laps, special tools required in the shop, and a supply of drill rod from which the die maker prepares the replacement sizing laps.

* * *

The die maker will follow a prescribed cycle that will closely parallel this general pattern. With knowledge of the finish die sizes required, he will refer to a chart to ascertain the proper meeting point diameter. This chart is a standard chart which reflects the policy of the wire mills regarding the approach angles, bearing lengths, and back angles. He obtains from storage a supply of dies and positions them near the chuck (see figure 10). The proper sizing pin is selected and mounted in the spindle chuck. A die is mounted in the head chuck and the automatic stop is adjusted. A small quantity of diamond compound of the proper grade is applied to sizing pin. The head is then engaged. At the point the lap passes through the die the head chuck automatically stops; the die is removed; a replacement die is mounted in the head chuck, and the cycle is repeated.

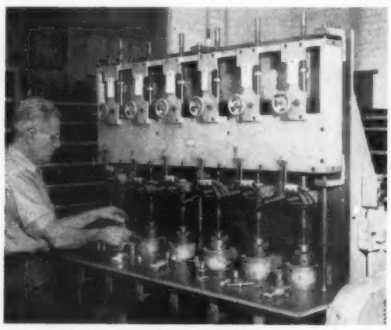


Figure 10 — Die Sizing Machine. * * *

* * *

Diamond compound is procured from suppliers in different strengths and grades. The lower grades or micron sizes will cut slower, but will produce a finer finish. Work was done in the Roebling Research Laboratory to determine which grades produced the best compromise, and are outlined in the chart.

Die Diameter Range (inches)	Diamond Compound Grade (nominal micron range)
0.050 - 0.099	15
0.100 - 0.149	30
0.150 - 0.250	45

Micron range is based on U.S. Government Standards outlined in a Department of Commerce publication entitled "Grading of Diamond Powder" Commercial Standard CS123-49.

The dies of a given size diameter are accumulated until the run is completed and then are washed in the ultrasonic cleaner, rinsed, dried, inspected, gaged, marked and racked for issuance (see figure 11).

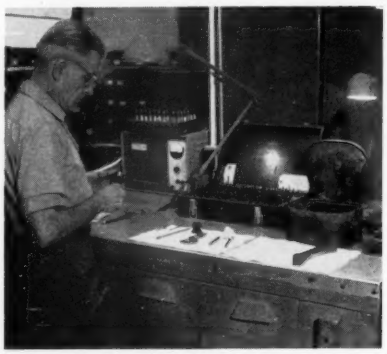


Figure 11 — Die Sizer Work Bench. * *

Should the diamond compound dry during the sizing cycle, the fluidity may be restored by a small addition of the compound solvent applied with an atomizer while the head is in motion. Application of the compound is presently being made by a cartridge gun to minimize any risk of injury to the die maker. Generally speaking, however, compound is applied only while the head is stopped, eliminating the risk of being struck with a moving chuck jaw.

* * *

The wash solvent from the ultrasonic cleaner and the contents of the filter are periodically changed so the diamond may be reclaimed. Prudent work along this line can substantially reduce the annual diamond abrasive cost.

* * *

The die maker operating the die sizer will normally complete the run on the sizer in three to four hours. He is also responsible for issuing and receiving used dies. New dies are issued on demand during the shift and the return dies are accepted and accumulated so that a continuous run may be made with the die cleaner (see figure 12). After cleaning, all dies are inspected and sorted by the die maker. The good dies are returned to finish storage and all others are put in

(*Please turn to page* 1729)

An Analysis of Wire Insulating by the Fluidized Bed Process

by
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This paper was presented at the Annual Convention of The Wire Association on October 24, 1961, at French Lick, Indiana.

In an earlier paper by C. A. Brown[2], experimental work conducted in this laboratory on the application of wire insulation by a fluidized bed was presented. Powders of polyvinyl chloride and polyethylene were fluidized and coated onto heated copper wire by a continuous process. This paper discusses an analysis of the fluidized bed coating process by which Brown's data have been correlated. This paper is mainly concerned with the mechanism of particle fusion as a key to better understanding the fluidized bed coating process. It is believed that this analysis provides a rational basis for future work in this area.

* * *

The over-all process of insulating wire in a fluidized bed may be thought of as a series of four subprocesses. These are:

1. Wire preheat;
2. Heat transfer from wire to polymer particles;
3. Sintering of the particles into a continuous film; and
4. Diffusion of bubbles of entrapped air (or fluidizing gas) out of the insulating layer.

* * *

For any given set of operating conditions and apparatus, the wire preheat operation is independent of the insulating material used. The determination of times for heat transfer necessary to fuse the polymeric material into a smooth coating is a complex problem. The solution of this problem requires a consideration of such items as particle size and shape, thermal conductivity and crystallinity of the polymer, and relative adhesion between the melted particles and the wire. Since a quantitative evaluation has not been made, variation in heat transfer will be regarded as primarily influencing coating thickness, but as having little effect on the total time of the over-all operation.

* * *

Diffusion rates of gas bubbles out of the film are influenced by such factors as bubble size, solubility of the gas in the polymer melt, and the diffusion constant. We will assume that the diffusion step is not rate-controlling in terms of the over-all process and therefore that variation in diffusion rates may be neglected. The remaining sub-process, namely the fusion of particles into a smooth film, can be shown to be strongly influenced by the nature of the coating material.

* * *

The mechanism whereby polymer particles fuse together is in all likelihood identical to the sintering of particles of glass or other amorphous material. Frenkel[5] has analytically developed equations defining the time dependence for the fusion of two spherical particles. For complete coalescence, the approximate relationship is where

$$t = \eta \frac{d^1}{\gamma} \qquad (1)$$

η = melt viscosity in poises,
d = particle diameter in cm,
γ = surface tension in dyne/cm, and
t = time in seconds.

* * *

Equation (1) is based on the assumption that the mechanism of fusion is viscous flow of the polymer. Shearing forces for flow arise from the release of surface energy as the particles coalesce.

* * *

Dillon et. al.[4] have studied the sintering of synthetic latex particles and have found good agreement with Frenkel's work. Kuczynski[7] has also shown Frenkel's analysis is valid for the fusion of spherical particles of glass onto a smooth glass surface.

* * *

We reason that equation (1) is valid for individual polymer particles and, further, that times required for complete fusion of a large number of particles are of approximately the same magnitude. It is then possible to predict fusion times necessary to achieve smooth insulating coatings on wire in a fluidized bed process. Using this equation, times for complete fusion have been calculated for a wide range of particle sizes and melt viscosities. Viscosities used were apparent viscosities calculated from melt index data from the relation [8]

$$\eta(\text{poise}) = \frac{7.5 \times 10^4}{\text{Melt Index.}}$$

Surface tension was assumed to be 25 dynes/cm which is a representative value for a large number of non-polar liquids at temperatures well below the boiling point. Equation (1) was modified to

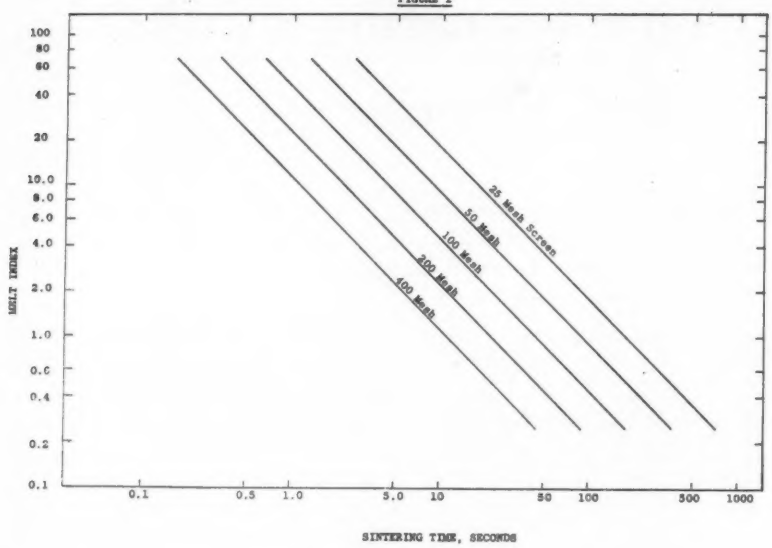
$$\log(\text{Melt Index}) = \log\left(\frac{75{,}000\ d}{\gamma}\right) - \log t \qquad (1A)$$

and the calculated data are graphically presented in this form in Figure 1. Since the melt index was used to calculate viscosity, Figure 1 is a constant temperature plot at 190°C (374°F), the temperature at which melt index data are obtained. The parallel lines represent parameters of constant particle diameter. Particle sizes were taken from standard sieve dimensions.

* * *

The times for complete fusion from Figure 1 were then compared to actual times available during wire insulating experiments conducted at this laboratory. Available

FIGURE 1



times were computed from the ratio of the total length of the heated section to the wire speed. The ratio, **R**, of available time to graph time is also tabulated. The resulting insulation has been classified as either "rough" or "smooth". These data are shown in Table 1. It is seen that large values of **R** and smooth insulation are well correlated. Also, values of the **R** ratio below 1.5 are associated with rough coating. Material D, where **R** is 1.2 has been successfully coated elsewhere[3] under conditions which could probably be represented by an **R** value closer to 2.0. With any given system of equipment, there should be a characteristic **R** value above which smooth coatings can always be obtained.

* * *

In order to obtain faster fusion rates, Frenkel's equation predicts that either the melt viscosity-particle diameter product must be lowered or that surface tension of the material must be increased. It is unlikely that significant progress can be made toward increasing surface tension. The practical limit of particle diameter reduction will be limited by economic factors; i.e., costs of pulverizing or otherwise preparing powdered polymeric materials. Even if cost were not a restriction, the minimum particle size is that which will fluidize properly without excessive particle entrainment in the leaving gas stream. The melt viscosity can be lowered, however, by increasing

TABLE 1

Material	Avg. Particle Diam., Std. Screen Size	Melt Index	Wire Speed, FPM	Total Sintering Time Available, Seconds	Predicted Time from Graph, Seconds	R, Available Time / Graph Time	Coating Quality
A (PVC)[1]	200	80	100	6	0.29	20	Smooth
B (PVC)	200	55	100	6	0.41	15	Smooth
C (PE)[2]	200	6.3	12	25	3.5	7.1	Smooth
D (PE)	100	2.2	12	25	20	1.2	Rough
E (PE)	100-200	1.4	10	30	23	1.3	Rough
F (PE)	100-200	1.3	10	30	25	1.2	Rough
G (PE)	100	0.25	10	30	178	0.17	Rough

[1] PVC = Polyvinyl Chloride

[2] PE = Polyethylene

the operating temperature. The limit to which temperatures can be increased is determined by the onset of rapid thermal degradation of the polymer.

* * *

The temperature dependence of the fusion time can be represented as

$$t = Ae^{E_1/RT} \qquad (2)$$

where A is a constant; E_1 is the activation energy of the viscosity; R is the Gas Law constant and T is the absolute temperature. The rate of the degradation reaction can be represented by

$$r = Ce^{-E_2/RT} \qquad (3)$$

where r is the reaction rate; C is a constant and E_2 is the activation energy of the degradation reaction. Equations (2) and (3) indicate that the decrease in fusion time gained by increased temperature (and reduced viscosity) can exactly compensate for the increased rate of the degradation reaction if $|E_1| = |E_2|$. However, this is actually not the case. A representative value for E_1 for branched polyethylene is 12 Kcal/gm mole[1], whereas values of E_2 are reported to be in the order of 60 Kcal/gm mole[6]. These figures indicate that if the average melt temperature is increased from 350°F to 500°F, fusion times will be reduced by a factor of about 8, but degradation of the polymer during the fusion step would increase by a factor of about 4000. The use of higher operating temperatures, in order to hasten fusion, depends upon the degree of degradation that can be tolerated. In many coating applications, this may impose a severe limitation on the maximum allowable operating temperature.

* * *

The above analysis of the fluidized bed coating operation to produce smooth homogeneous films has been based on the assumption that the principal process variable is particle fusion time. By consideration of this variable only, data from wire insulating experiments have been correlated. The relationship between thermal stability and the product of melt viscosity and particle size has been shown to exert a major influence on the applicability of this process.

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(*Please turn to page* 1732)

Investigation of Variables in the Zinc Socketing of Wire Rope and Strand

by

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A paper prepared for presentation at the Annual Convention of The Wire Association in French Lick, Indiana, October 25, 1961. Mr. Smollinger is a graduate of fayette College with an M.E. degree and ics. He joined Bethlehem Research in 1950. Mr. Cornish graduated from Lafayette College with an M.E. degree and entered the employ of Bethlehem at Lackawanna. He joined Research Department in 1959.

John B. Cornish

Introduction

Wire rope or strand used to support a structure or operate equipment requires a terminal fitting. Many mechanical devices and splicing methods have met this purpose; probably the most efficient is the inverted, tapered, soft-metal cone terminal in a metal holder. This method is commonly called "socketing".

* * *

The practice of attaching soft metal cone terminal ends onto wire rope and strand is an old art. In many cases white metal cones were cast onto the ends of rope specimens by use of molds. Conical wedges have also been inserted into conically recessed holders so that wedging occurs under load. In others, the broomed-out strands of the rope were inserted into a conically recessed holder or socket and molten white metal poured into the recess. In more recent years zinc has also been used as a soft metal for socketing wire rope and strand. The molten zinc is poured into a socket containing the broomed-out wires.

The generally accepted practices written into specifications for attaching zinc sockets have not changed much from the common practice years ago. The use of gasoline as a cleaner, muriatic acid pickle, water wash and high grade zinc at a given temperature is generally the practice today. The use of high grade zinc conforming to ASTM Specification B-6 has more recently become common practice.

* * *

Because these practices accumulated gradually over many years, it was thought that they should be examined to determine the best way for attaching sockets to wire rope and strand. Also the validity of past and present accepted methods and specifications which stipulate certain practices (such as pickling) as necessary for obtaining satisfactory results needed testing.

Socketing Variables

It was believed that if experiments were to be meaningful for determining the holding power of zinc sockets in wire rope and strand, they must evaluate the contribution to holding power offered by each of the variables considered to be pertinent. These are:

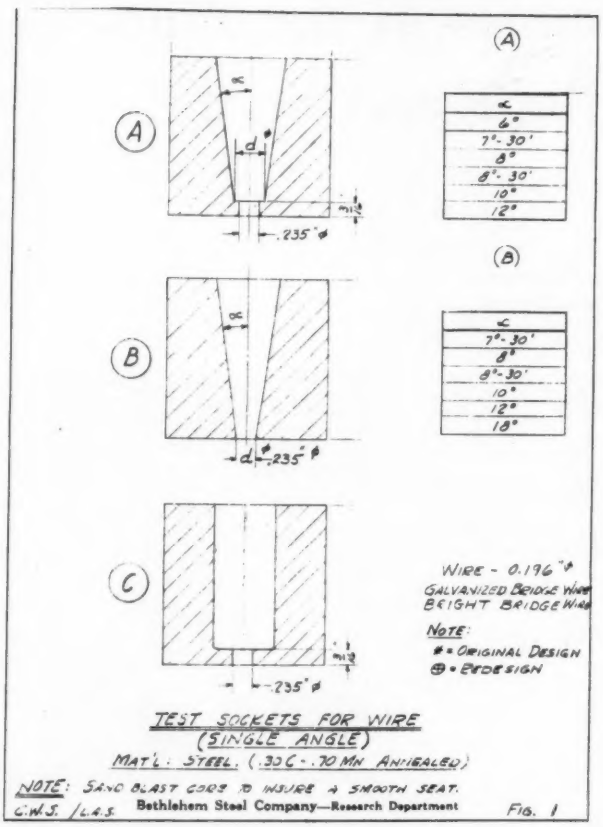
(a) Bond Shear Strength.
(b) Wire Preparation.
(c) Basket Design.
(d) Effect of Zinc Spelter and Socket Temperatures.
(e) Other Socketing Materials besides Zinc.

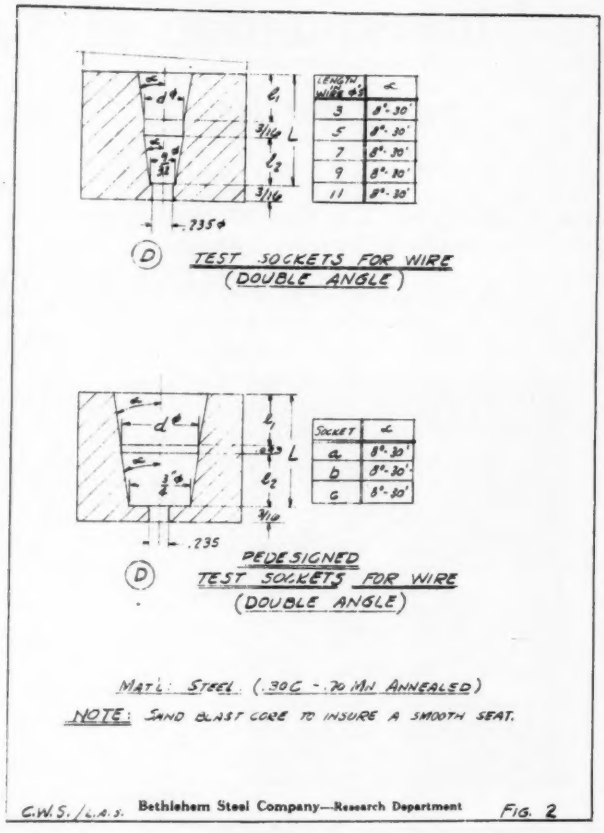
Zinc Socketing With Single Bright and Galvanized Wires

Each of the above variables was evaluated with single wires, both bright and galvanized. (.195″ ϕ bright and .196″ ϕ double galvanized bridge wire). Special single wire sockets were made for the tests. High grade zinc spelter was used.

* * *

Initial single wire tests were made with four types of sockets (Figures 1 and 2). One was made with a single basket angle that terminated in a bowl and had an opening large enough for the wire to pass through the bottom of the socket. Socket "A". Another socket, "B", was similar except that the basket angle extended to the very bottom of the socket. A third socket, "D", had a double basket angle. These single sockets were used to evaluate the effect of wedging. A fourth socket, "C", with straight sides (no basket angle)





was used to determine the actual bond shear strength of the zinc spelter to the wire. All test sockets had a bottom opening sufficient to accept the wire with a small clearance.

* * *

Many tests with these single wire sockets were made with varying basket angles and the wires inserted different distances (multiples of wire diameter) into the socket. Zinc temperature at pouring was 975°F to 1030°F. Low and inconsistent test results on sockets "A", "B", and "D" and fairly good results with "C" led to the redesign of the contoured sockets to permit a wider opening around the wire in the base of the socket: This permitted the molten spelter to contact the wire a longer time before freezing.

* * *

Tests were then continued using the "C" socket and varying the wire preparation to determine bond shear strength of the zinc to the wire surface. The various wire preparations used were as follows:

(a) Cleaned — pickled in Hydrochloric Acid (HCl).
(b) Vapor degreased.
(c) Cleaned in other solvents.
(d) Degreased — fluxed.
(e) Solvent cleaned — fluxed.
(f) Pickled — fluxed.
(g) Degreased or solvent cleaned — then pickled in HCl and fluxed.

The test results with this socket clearly showed the effect of wire preparation on bonding. A minimum bond shear strength of 5500 psi on bright wire and 7500 psi on galvanized wire and a maximum 11,000 psi was obtained on bright and galvanized wire when the cleaning practice and/or pickling in HCl was followed by the appli-

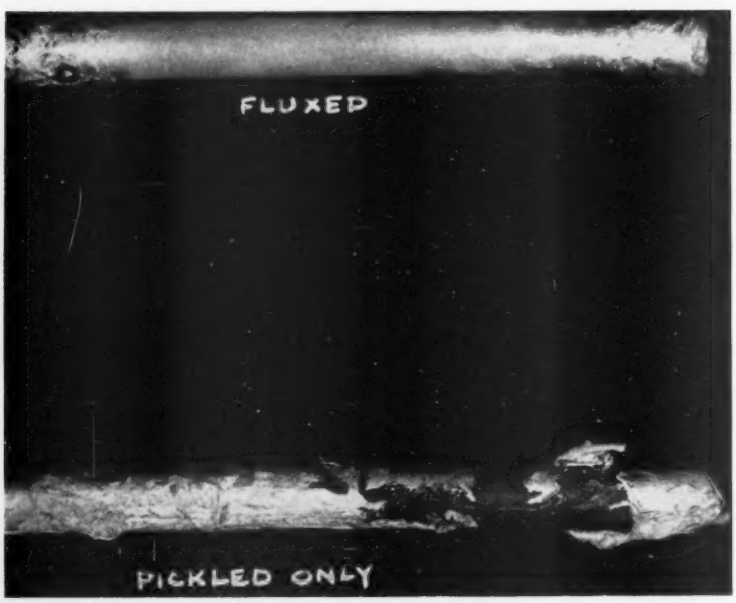


Fig. 3 — Adhesion of zinc spelter on "A" coated 192" ϕ wires. * * * * *

cation of a zinc ammonium chloride flux. This compares with a bond strength of only 3000 to 5500 psi on galvanized wires merely cleaned in a degreaser. Pickling the bright and galvanized wires in HCl prior to pouring the molten zinc into the test socket gave the lowest bond strength, about 1500 psi to 2000 psi.

* * *

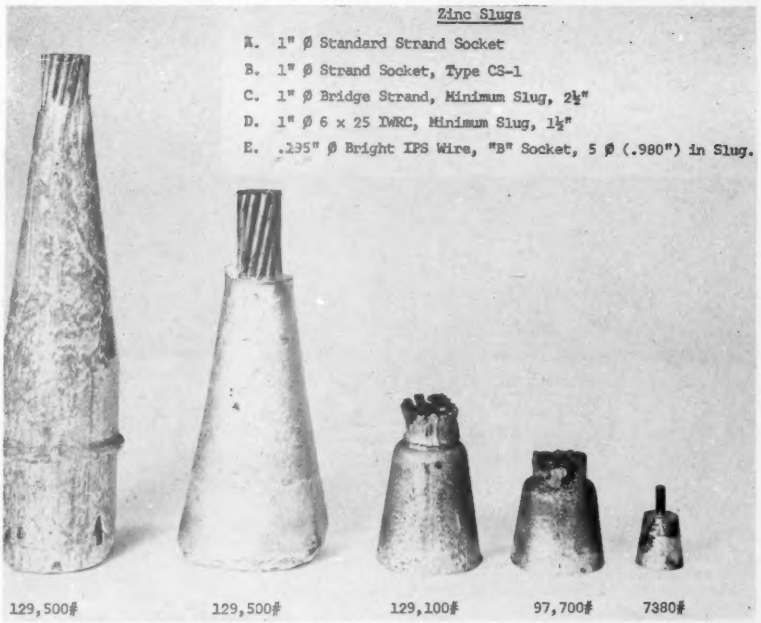
As a further demonstration of the value of the flux in obtaining consistently good bonds, a group of wires was processed through cleaning and pickling and another group was cleaned, pickled and fluxed. Both were then dipped in molten zinc. Comparing the coatings on the fluxed and unfluxed wires shows clearly the difference in adherence of the zinc to the wire (see Figure 3). The fluxed wires had a tight coating while the coating flaked off the unfluxed wires.

* * *

The first group of tests with the altered "A", "B", and "D" single wire sockets showed that a wide range of basket angles from 7°-30′ to 18° on a side were satisfactory from a wedging standpoint. However, the 8°-30′ basket angle was taken as the most practical on which to base testing and socket design. The wider basket angles require a heavier socket to maintain a maximum unit design bursting pressure. Also, the amount of additional zinc would add unnecessary weight to the assembly. With an angle of less than 7°-30′ the wedging decreased somewhat and the broomed-out wires tended to bunch up and lay together against the basket.

* * *

Further experiments with the 8°-30′ basket angle (Figure 1) showed that the "B" socket (open bottom) gave the maximum increase in holding strength over the "C" or bond shear test socket. The "A" or closed bottom socket results were almost as good as that of the "B" socket but the movement of the zinc cone was less. There did not appear to be any advantage in wedging with the double angle basket contour (Figure 2). The holding power of the "D" socket was about equal to that obtained with the "B" socket.


Zinc Slugs
A. 1" Ø Standard Strand Socket
B. 1" Ø Strand Socket, Type CS-1
C. 1" Ø Bridge Strand, Minimum Slug, 2½"
D. 1" Ø 6 x 25 IWRC, Minimum Slug, 1½"
E. .235" Ø Bright IPS Wire, "B" Socket, 5 Ø (.980") in Slug.
129,500#
129,500#
129,100#
97,700#
7380#
Fig. 4 — Load at wire failure.

The actual total holding power due to shear strength of the bond combined with wedging with sockets "A", "B" and "D", was 7500 psi to 12,000 psi on bright wires and 8500 psi to 12,000 psi on galvanized wires when the wires were fluxed. When the wires were not fluxed but only pickled, a maximum holding power of 2500 psi resulted. This suggests that where bonding strength was low, holding power due to wedging was not developed.

* * *

Some tests were conducted by varying the temperature of the socket and the zinc temperature at pour. Cold sockets gave poor bonds. Cool zinc also produced poor bonds. Very hot sockets and hot zinc developed weak bonds. A socket that has been warmed to about 200°F seems to remove any moisture and prevents rapid freezing of the zinc. A zinc temperature between 975°F and 1030°F at pour gave the best results.

Other Socketing Materials

Other tests were made using various plastic epoxy resins as a socketing medium. These tests were made with both the single wire test sockets and in steel blocks having only .007″ clearance in diameter. The purpose of this was to determine the actual shear bond strength and to determine if difference in shear strength prevailed when a greater mass of the epoxy resin was used, such as in a socket.

* * *

None of the heat-cured or air-cured expoxies were capable of developing above 50% of the maximum bond strength of zinc spelter. However, the maximum holding power developed was about 6000 psi on an epoxy cured at 350°F for one hour. With a 2 day air-cured epoxy the maximum holding power was about 3000 psi. Although the unit bond strength of the plastics tested was only 50% that of the zinc, the large bond area available in a standard type socket permitted development of the strength of the rope in a tension test. A single test was made with a full socket using a 2-part air-cured compound on a 1″ ϕ rope (6 x 25) independent wire rope core, that was broomed and cleaned in chlorothane. The rope failed at 98,850 pounds with no sign of slippage in the socket. Prices for the various epoxy resins tested varied from $1.60 to $2.00 per pound in bulk quantities.

* * *

Tests using a solder and flux also gave holding power strengths which were approximately 3000

(*Please turn to page* 1725)

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Ultrasonics in Motion

by James R. Logan
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General Instrument Corporation
Harris A.S.W. Division
Woodbury, Connecticut

This paper was presented at the Annual Convention of The Wire Association on October 25, 1961, at French Lick, Ind.

The use of ultrasonics as a tool in manufacturing is not new in the American industrial scene. Most certainly it is not new in the metals industry where researchers have been applying it to everything from rolling mills to castings.

* * *

Ultrasonics had its start in Europe before the turn of the century. A product of the physical sciences, it remained a laboratory curiosity until World War II pushed it into prominence as Sonar or underwater detection. In its early college days, ultrasonic energy was produced by quartz crystals and used to demonstrate the phenomenon of high frequency emulsification of insolubles such as mercury and water. The use of crystals or ceramics to convert electrical energy is called piezo-electric. High fidelity fans will be interested to know that this property of certain crystals, mostly rochelle salts, was used in early recording work and in phonograph pick-ups. The reverse is the basis upon which the crystal microphone operates.

* * *

In the early 1950's, magnetostrictive metals were applied in place of the crystals to overcome heat and fragility problems. This signaled the start of claims and counter claims which have rivaled that of tobacco manufacturers and cancer experts. The pros and cons of these two methods for the generation of ultrasonic frequencies will not be discussed in this paper, as they constitute a study which would take several hours to cover. It is enough to know that they can be obtained from the two nearest salesmen of opposing ultrasonic equipment manufacturers.

* * *

The use of ultrasonic energy is most widely known today in the field of cleaning. It has reached into almost every type of manufacturing in the United States and into such places as hospitals, dental offices, food processing plants, biological laboratories, radioisotope decontamination and countless others. Those selling the devices are constantly being surprised at the new cleaning applications developed by enterprising production and laboratory personnel who have purchased the equipment. Ultrasonic cleaning is particularly in demand in such fields as have need for cleanliness on the micron level. A micron is one thousandth of a millimeter or .000039 of an inch. Particles of a few microns or less can, in the right place, cause the erratic flight or complete failure of a missile or aircraft.

* * *

In the past two years, considerable interest has been shown by the ultrasonic devices manufacturers in the field of wire and wire products. Interest was shown as long as seven years ago, but the lack of applications knowledge and the high cost of generators and transducers combined to make the field look unattractive. Today several manufacturers are actively engaged in research and development work for the wire industry and strip mills with some good processes being developed and currently in use. This has been made possible by the advanced state of the ultrasonic art, both in industrial processing and design and development of the equipment itself.

* * *

Like all first steps, the first attempts at wire cleaning were dogged with uncertainty and failure. The high speeds with which non-ferrous wire is drawn caused the ultrasonic cleaning engineers to recoil in doubt and make at best only a half hearted attempt. Until the past year, when better cleaning techniques, solutions and equipment were matched, there was little ultrasonic wire cleaning performed in the United States. The high speeds are still a problem, but one which there is some hope of resolving. In the past, attempts at ultrasonic cleaning of non-ferrous wire was made in the bundle. This largely ended in failure for two reasons:

(1) Round wire is reflective. Instead of absorbing the high frequency sound waves and propagating them toward the center of the bundle, the majority of the energy is reflected and scattered. This is similar to the large half sphere shapes put on early broadcasting and recording studio walls to scatter sound and prevent echoes.

(2) Early attempts were made using acids as a cleaning media. By the time the inside strands were cleaned (largely by chemical action alone) the ultrasonic energy plus the acid had reduced the diameter of the outside strands out of tolerance. We have now come to some backstage activity which bears closer scrutiny.

* * *

One of the effects of high frequency energy in a liquid is that it promotes chemical reactions whether they are desired or not. In the majority of cases in cleaning they are not only desired, they are courted. Some chemical reactions are, unfortunately, not always beneficial. In the case of bundle cleaning of wire, the ultrasonic energy put the acid to work at **increased** activity on the outside of the bundle, but not on the inside since little or none of the sound reached the center. This would be similar to increasing the heat or concentration of the acid on the outside of the bundle, but not the inside. The solution to this problem was to change from acids to alkaline

detergents. The change brought with it several advantages. First, and foremost was the fact that alkaline detergents themselves do not attack the majority of non-ferrous alloy wires. For the few types that are attacked, other cleaning solutions are available. The second advantage is that ultrasonic energy activates the alkaline cleaners, but does not cause them to attack the brass, copper, etc. Thirdly, higher temperatures can be employed without increasing the danger to operating personnel such as would be the case with acids. The author realizes that the act of elevating the temperatures of a liquid increases the danger of burns. What is implied here is danger from fuming and "bumping" as is common with acids. Higher temperatures in alkaline cleaning means better cleaning and coupled with ultrasonic energy it means teamwork hard to beat. There are other advantages of lesser degree such as lower cost in alkaline cleaners, etc.

* * *

The practice of expanding a bundle for cleaning makes bundle cleaning with ultrasonics far more practical, but brings with it a serious disadvantage. The problem of misplaced turns and breakage, particularly in flat wire, are well known to all in the field. In methods of strand cleaning where speeds are low enough for ultrasonic cleaning, there are no problems of breakage at the factory or customer complaints due to breakage during uncoiling. This is because there is no cleaning after coiling. Cleaning is performed immediately before or after drawing. It is on the shaped wire rolling mill that the big savings in labor can be realized. Here, strand cleaning would eliminate expanding the bundle with all of its attendant problems. In addition, and this is of real importance, with the proper cleaning at the proper stages of wire manufacture, a far cleaner product is placed in the hands of the consumer. In some consuming industries, this is of metallurgical importance and not just to keep a machine operator's hands clean. For instance, this has sales appeal to a user who must plate or otherwise surface finish the wire.

In addition to the foregoing, the use of strand cleaning immediately before or after drawing can bring additional advantages. By the elimination of bundle cleaning, storage, and handling before and during bundle cleaning are also eliminated. This results in shortened production time and release of additional floor space. Handling during cleaning operations will be eliminated because the cleaning will be completely automatic.

* * *

Earlier, strip mill cleaning was mentioned. There are installations running today which are highly satisfactory in economics and product. The ultrasonic cleaning process was first used on stainless steel strip, but soon spread to nickel. Here, the demand was not for savings although they are in evidence. The need was for a strip which could be offered to the consumer free from smut or oxided surface. Because considerable tension is required in the mill, ultrasonic cleaning takes place as a separate process. Nickel strip cleaning is simple and quick. The strip is fed from the payoff reel into the ultrasonic cleaning tank. The immersion transducers are located immediately above and below the strip. It then runs into a rinse, through a final water spray, through wipers and is dried.

* * *

Ultrasonic cleaning of stainless steel strip is somewhat more involved. From the payoff reel the strip runs through a pickle bath and into a cold water overflow rinse. This is followed by a cold water spray prior to the alkaline cleaning tank which is activated by immersion transducers located above and below the strip. Once again spray rinses are employed after which the strip is run through a hot water bath and wipers to speed drying.

* * *

The processes described are ones which have returned profits and are consistently paying their own way. They have eliminated cleaning rework and handling, currently operate at speeds between ten and twenty feet per minute and will withstand temperature ranges up to 350°F, all on a twenty four hours a day basis.

In the cleaning of ferrous wire, there are some process similarities to non-ferrous wire. Stainless steel wire will be taken as an example.

* * *

The problems involved with stainless steel have most of their roots in the lead coating applied for drawing. After drawing the wire must be annealed to permit further reduction. Before the annealing is performed the lead coating must be removed or damage will result to the annealing tubes from the lead which melts off. Also changes take place in the metallurgy of the wire. Deleading is done in the coil in hot acid, usually between 140° to 160°F. After deleading, a sample of wire is cut from the coil (one end or the other, both being on the outside) and checked for lead. This consists of bringing the sample of wire to a boil in acid, cooling and neutralizing a few drops with an alkali. To the neutralized sample is added dithizone and the sample shaken until the proper colors appear, orange to gold negative, pink to red positive. When the proper cleanliness is ascertained, the bundle is run through the annealing furnace and again placed in the acid bath to make sure that all lead has been removed.

* * *

Now let's back track, go through the system again to see how the addition of the proper ultrasonic cleaning processes at the right places will work and what value can be derived from its use. Let's pick up after drawing, when the coil is to be deleaded.

* * *

First, the lead would not be removed in the coil, but from the running strand. This can easily be accomplished as the wire runs into the annealing furnace. The deleading procedure would be as follows:

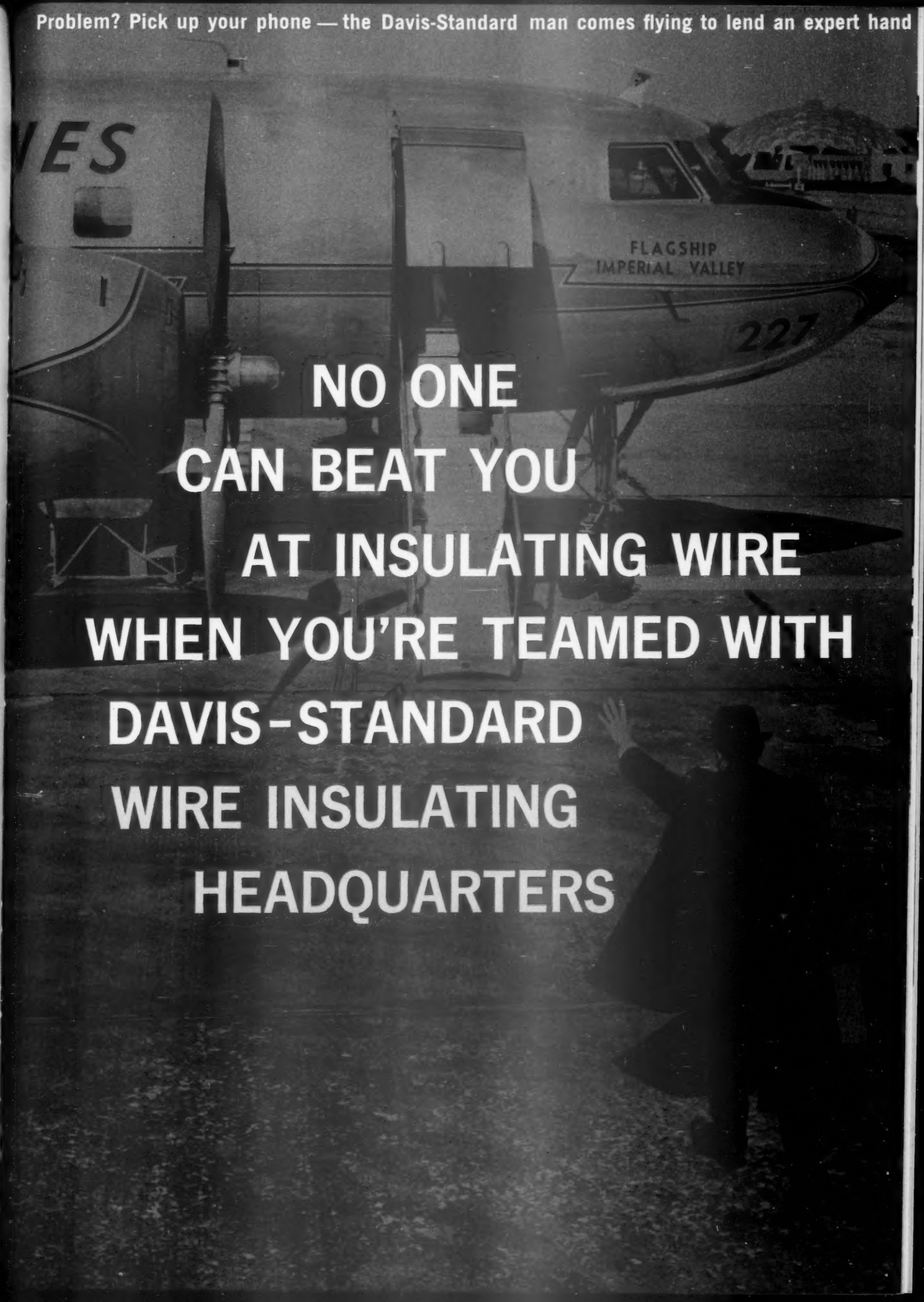
Step #1 Running at speeds up to 20 feet per minute, the wire would go through a bath of hot (140 - 160°F) acid which is activated by ultrasonic energy.

Step #2 A water rinse and wiper to remove excess acid

Step #3 An alkaline rinse to neutralize the acid

Step #4 A water rinse and wiper to remove excess alkali

(*Please turn to page* 1723)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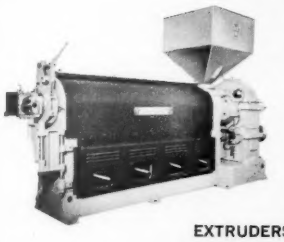

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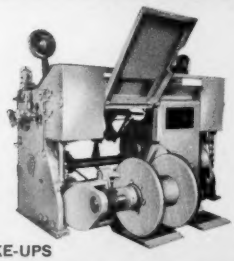

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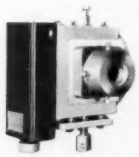
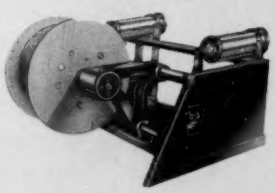


CROSSHEADS



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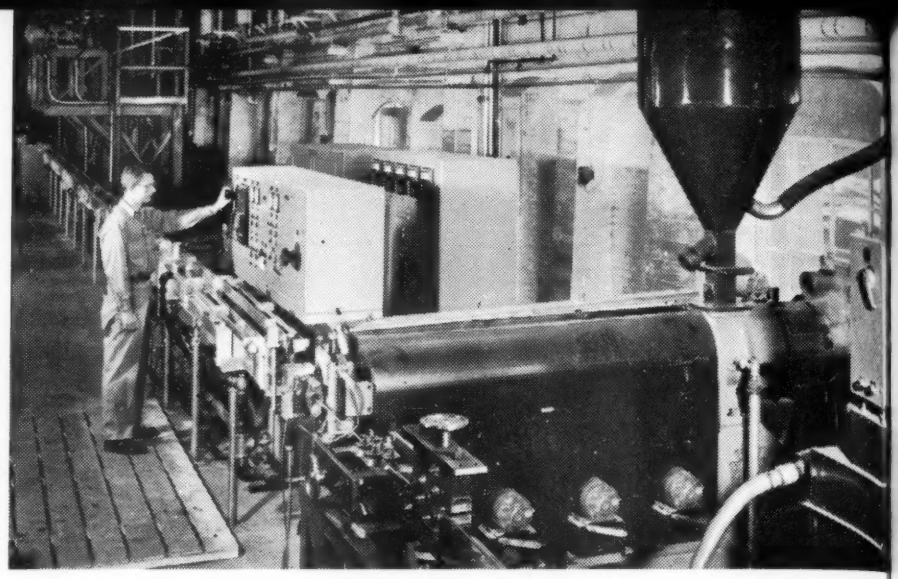

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Charts, Graphs and Diagrams for Use In The Wire Industry

by Eric F. Jubb, Esq.
Chief Inspector, Galvanizing Departments
Rylands Brothers Limited
Warrington, England

A paper presented at the Staff School of the Caledonia Works of the Frederick Smith & Co. Wire Manufacturers Ltd., Halifax, England, through whose courtesy it is published in Wire and Wire Products.

Throughout industry it is necessary to produce statistics in many varied forms and in any industry as complex as modern wire manufacturing it is becoming increasingly important that all concerned are kept "in the picture" all the time. There is a tendency however to produce masses of data in the forms of columns of figures which are exceedingly difficult to assimilate and visualise as a coherent picture.

* * *

The object of this paper is to set down some ideas and suggestions of how this general problem can be approached within the wire firm. What use can be made of charts, diagrams, graphs and such like to produce the picture more attractively and above all "easier to read". Far too often large doses of information are loosed upon the Management, usually historical data or, should we say "hysterical", as a mild form of hysteria tends to develop down the chain of command if someone suddenly hits upon a new slant of interpretation.

* * *

Can we produce this information quickly and issue it rapidly to all concerned? Yes, but can we do it so that comparisons can be made without falling into the trap of comparing two or more sets that are not on the same basis or scale?

* * *

We must make use of the simple statistical significance tests to show up changes in our productions and costing. We must spend more time in analysing data instead of just collecting it for collectings sake. We must see that as much information as possible gets down to the shop floor level in an understandable form.

* * *

There are many text books on charts and graphs and it is not the writer's intention to go into the various rules and regulations that must be thoroughly understood before any work of this type is attempted. It is so easy to produce a chart or graph to impress someone but at the same time it does not tell the whole truth. The whole technique of graph production must be very carefully studied.

* * *

It now becomes obvious that a small staff of trained personnel are required to carry out this work but it should be remembered that by careful organisation they can do all the charting required for all sections of the firm. In fact they become a sort of clearing house or information centre for the whole works.

* * *

First of all let us consider some simple suggestions to enable all departments to think alike and act upon set lines. We do not suggest that this is not done at the moment but here are some ideas for what they are worth.

* * *

One method is to number the weeks of the year and use them as reference numbers. This avoids trying to tie up week endings and month endings within the year or over a number of years. For the purpose of this paper we will assume that Week 1 is the first week in January but it may be more convenient in other instances to make Week 1 coincide with the start of the financial year or again start immediately after the Summer Holiday closedown period. Whichever method is adopted a small card should be issued at the beginning of each year clearly stating dates and week numbers.

* * *

The next question is the months; many firms already use the 13 month year, thus neatly splitting up the 52 weeks. The normal calendar months are also widely used but this method causes problems to arise when statistics have to be compared between 4 and 5 week months.

* * *

Generally speaking the 13 month year is ideal except where statistics have to be supplied for use outside the firm. We will assume that our information is for internal use only and therefore all our charts and graphs will be based on 13 x 4 week periods.

* * *

Again to assist it would be advisable to indicate if any weeks are not full weeks as comparisons can be misleading if week 13 in one year includes Good Friday and the following year it is in week 15. A simple way is to underline the week number every time it is a shortened week. How much short is, of course, important but the main purpose is to warn the reader that there is a difference. Complete shut down weeks should be ringed to avoid confusion.

* * *

There is no need to carry on this identification any further as it becomes unnecessary and we would not know where to stop.

* * *

A further safeguard should be adopted to enable charts and data sheets to be identified immediately whether they are hourly, week-

ly, monthly, yearly or whatever period of time we like to use. This is done by means of a simple code:—

A. Daily chart.
B. Weekly chart.
C. Four week (monthly) chart.
D. Three monthly period.
E. Six monthly period.
F. Yearly chart.
G. Five year period.

This code letter is always printed in the top right hand corner whereas the week numbers are incorporated in the title.

* * *

Another small point for general guidance is the use of colour in the headings. For example:-

i. All charts with Red headings are for Restricted circulation.
ii. All charts headed in Green are for distribution down to departmental Management.
iii. Black headings signify that the information is completely unrestricted and can be displayed to shop floor personnel if necessary.

* * *

Finally it is advisable to have a standard size sheet for all graphs, charts and data sheets. This means that the binders, for general filing, the transparent plastic covers for use on the shop floor, and the display frames mounted on the office walls are all the same size and there is no danger of receiving misfits. Providing we maintain a definite standard, production of the charts is simplified and advance printing can be laid on to speed up the issue.

* * *

So much for the relatively simple, although essential basic details regarding the mechanics of chart production again without dwelling at all on the use of pen stencils and drawing equipment to achieve the high standards necessary in this form of work.

Programming and Planning

This type of work can be simplified, in many cases, by the use of charts and the best type for this sort of problem is the Gantt Chart. (Fig. 1.)

* * *

Our Gantt Chart is usually a weekly chart of five or seven days, each day being split up into hourly or multi-hourly periods. For our example we will take the weekly programme for a high speed one hole wire drawing machine, remembering that programmes for a batch of machines can be tackled in the same way providing some thought is put into the layout of the Gantt Chart.

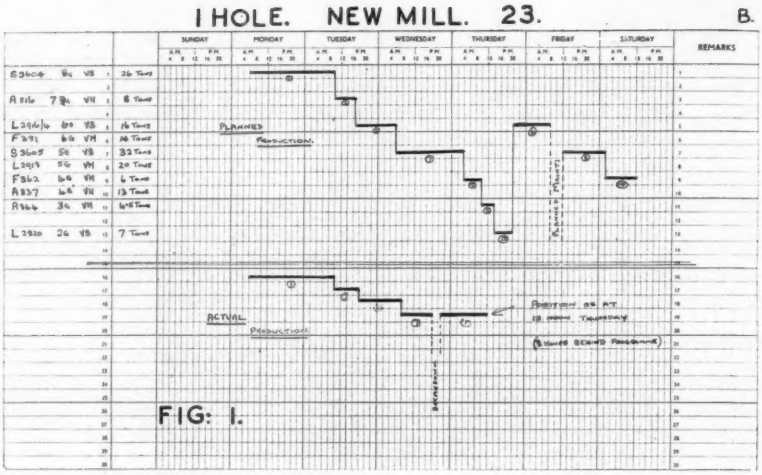


FIG: 1.

* * *

A further advantage in using this type of chart is that the production can be drawn in underneath the planned line, thus giving an immediate and accurate comparison almost hourly.

* * *

From the incoming requisitions to the wire department a data sheet is produced giving all the essential details of the order and against each one the calculated production time is stated. In this particular case D C motors are used and therefore variable times are shown for varying sizes and draftings.

* * *

To illustrate, a 48 hour programme is listed without going into detail of meal breaks etc., as follows:-

26 tons	**8G**	**26**	**hours**
15 tons	**6G**	**10**	**hours**
12 tons	**5G**	**6**	**hours**
5 tons	**4G**	**2.25**	**hours**
10 tons	**3G**	**4**	**hours**
1 ton	**2G**	**0.33**	**hours**
2 tons	**1G**	**0.4**	**hours**
10 cwts.	**1/OG**	**0.16**	**hours**

* * *

Because of raw material availability and other reasons a definite programme sequence is now laid down ready for transference to the Gantt Chart. The hourly time scale is across the top of the sheet and down the side we have the size ranges. The sheet is now drawn and can be displayed in the wire mill office for use. A requisition number from the data sheet is added over each item for ready reference of further essential details not included on the chart. As the production is weighed off a line is drawn underneath each planned line and it can be seen at a glance whether production is lagging or gaining.

* * *

Comparison at a later date by the Departmental or Works Manager will show up either good or bad programming and/or high or low production efficiency that required further detailed investigation.

* * *

The Gantt Chart can be applied in this way to many of the wire departments and there is no reason at all why provisional advanced programming cannot be done under the same system. Wherever it is necessary to convert tonnages to time scales a Gantt Chart will give the answers far more realistically than a column of figures.

* * *

This type of chart can be used in galvanizing plants with some advantage as many orders have to be executed at speeds far removed from the scheduled speeds. For example, suppose the programme for a 20 end galvanizing frame shows a planned production of 50 tons of 14g together with some odd items of finer

gauges. The finer gauges must be plotted at the 14g rate which is slower, whereas on another occasion the position could be reversed and the time for production considerably reduced. Multi-end plants in these days or large coils at the input end can cause substantial errors in programme calculation unless the scheduled times and actual times are carefully correlated.

* * *

The Gantt Chart can also be put to excellent use in the Engineering Section to show planned maintenance and overhaul of machines and plant. By comparing this chart with the programme chart in the Wire Mill, remembering that they are on the same scale and in the same size, much time can be saved in actual planning.

* * *

It also becomes obvious that the cleaning house programme can be produced rapidly by simply advancing the wire mill chart 2 or 6 hours according to the normal time lag required in that particular department. (Fig. 2).

* * *

There are many applications throughout the industry where the Gantt Chart or a modified form can be used to great advantage and every possible avenue should be explored.

Bar Charts

This type of chart using vertical "bars" can be used with great success providing an important point is borne in mind. The base line must always be set at Zero, otherwise a wrong interpretation will be formed. An example of this is shown in Fig. 3. As you will see these examples are showing sales of various types of wire and wire products and although both charts are showing the same detail, the wrong impression is created by the shortened chart.

* * *

Again modifications can be applied to this chart of diagrams by making the bars horizontal instead of vertical and using parts of the bar in contrasting colours to indicate the percentages.

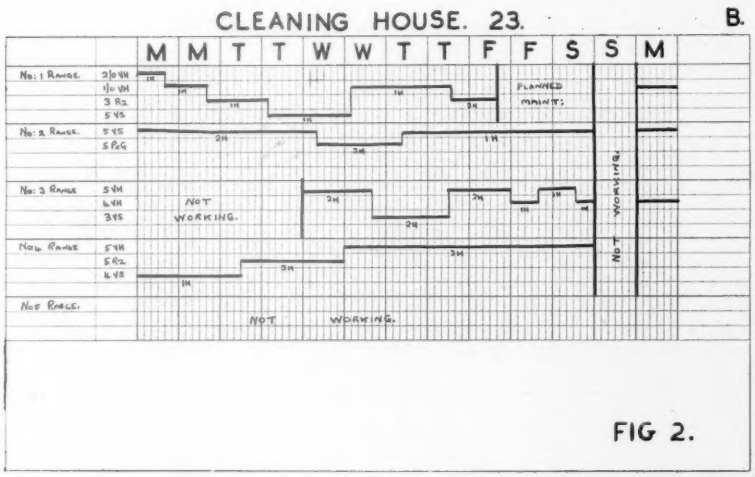
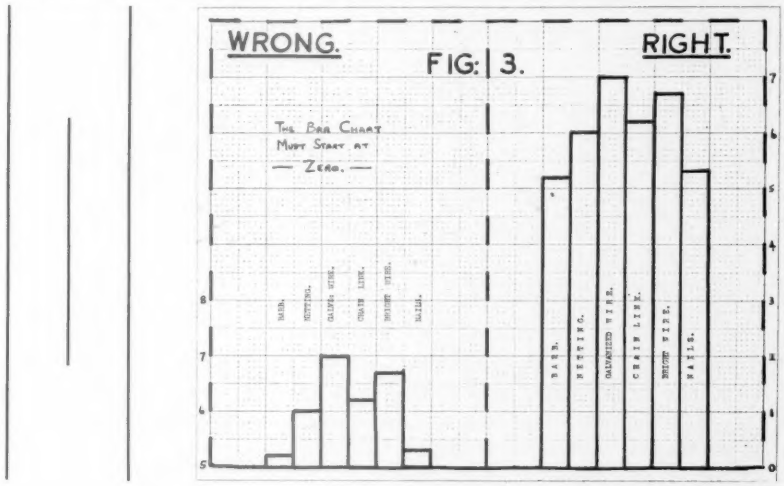


FIG 2.



A simple illustration of a horizontal bar chart may be issued to the personnel department—Fig. 4. The horizontal bar is much easier to read, particularly when the titles are of great importance and usually consist of three or four words.

* * *

Only one of the co-ordinate lines is used for figures and instead of the usual practice of putting them along the bottom line they are in this case, at the top. Note once again the scale starts at Zero. Should it, however, be necessary to make a chart that does not start at Zero, a distinct break should be illustrated.

* * *

Bar charts are also very useful for display in departments to show production, efficiencies, labour and bonus schemes. They create interest and are very easily understood.

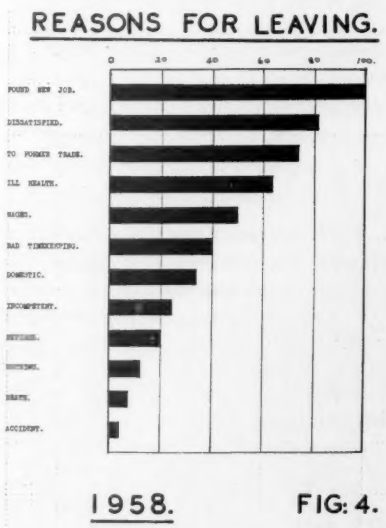


FIG: 4.

Progress Charts (Arithmetical)

Of all the graphs and charts used perhaps progress charts are the most widely used and best known. How often have we seen

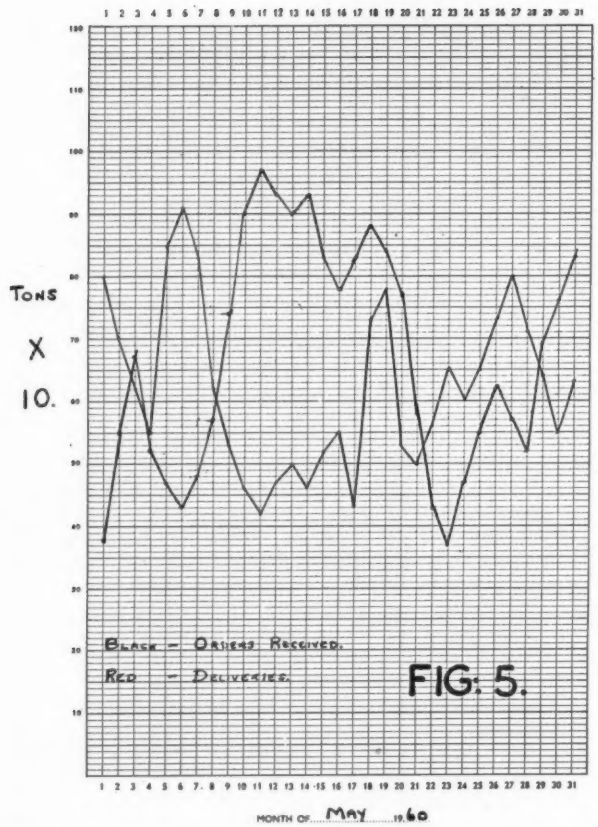


FIG. 5.

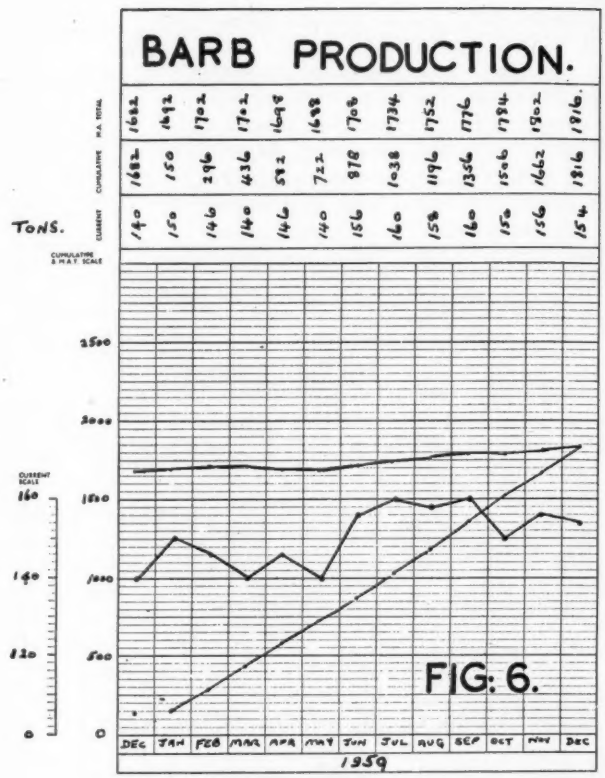


FIG. 6.

them depicted in cartoons (usually in the Sales Manager's Office) and the line has had a decidedly upward (or downward, according to the caption) trend, off the chart and onto the wall. This, of course, is bad practice and is frowned upon by higher Management. However, seriously speaking, a great deal of information can be readily shown on a progress chart and there are unlimited possibilities.

* * *

It is often said that all such charts should not only show the line or trend but also show the actual data in figures. Many prepared charts are made for this purpose; again it is a matter of opinion whether the data should be included or not. In some instances this is advisable but again in others it is not really necessary. In all cases the source of the data should be shown.

* * *

Fig. 5 shows our Sales Manager's chart of wire orders (tonnages) received and a trace of deliveries can quite easily be produced on the same scale and super-imposed when required, or alternatively as we have done, add the deliveries in another colour.

* * *

One of the most interesting features of this chart is a method of producing a composite graph of many varied and apparently unrelated groups of data. Note this is a final and not a working chart. This is done by producing a whole series of graphs on a large sheet with the same time scale and a glance will show up any apparent relationships at once. A reasonable selection to be plotted together would be rod input, wiredrawing production, galvanizing wire production, wire products production, labour turnover, sickness and absenteeism, and wages.

* * *

As stated at the start, our intention is continually to compare all our charts, therefore, it is not really necessary to produce this special type of composite graph but mention has been made here in case it should be required.

While dealing with the progress charts we must spend some time looking into the techniques of the "Z" graphs. A "Z" graph is so called only because the three lines recorded on the graph form into a letter "Z", although it always sounds impressive when quoted. The whole basis of the "Z" graph technique is a "Moving Annual Total" (M.A.T.) and once it is operating it is simplicity to calculate it each week or month or even each day.

* * *

Suppose we are recording the Barb Department production, (see Fig. 6), normally we would plot a scale line on a progress chart and leave it at that. Each month the line is extended to show the current monthly production. A simple method to arrive at this M.A.T. is to record each month for a year the monthly totals. On the first month of the current year we add the total to the production total for the previous year and then deduct Month 1 of the previous year. We can now plot this total on our graph. This M.A.T. is produced each month and at the same time a cumulative total is also calculated. The

M.A.T. total becomes the top line of the "Z" and the cumulative becomes a diagonal. The bottom line of the "Z", is of course, the monthly progress line and need not be on the same scale. This "Z" graph of the Barb Department production, although giving a true picture, is a good example of choosing a wrong scale. The current month's production line should be a lot lower and this making the "Z" more pronounced.

* * *

In Fig. 7 the Netting Production "Z" graph is based on a weekly M.A.T. and in this case the scales are much better. It will be noticed that the drop in production is already having a decided effect on the M.A.T. and unless the trend is changed we can already see what our yearly production will be. It will be clearly seen that when the graph has been in operation a few months it is almost possible to forecast what will be the answer at the end of the year by simply projecting the M.A.T. and C.T. lines at the same general trend until they meet. This system of using the M.A.T. on a chart is extremely useful and well worth investigating for many types of work.

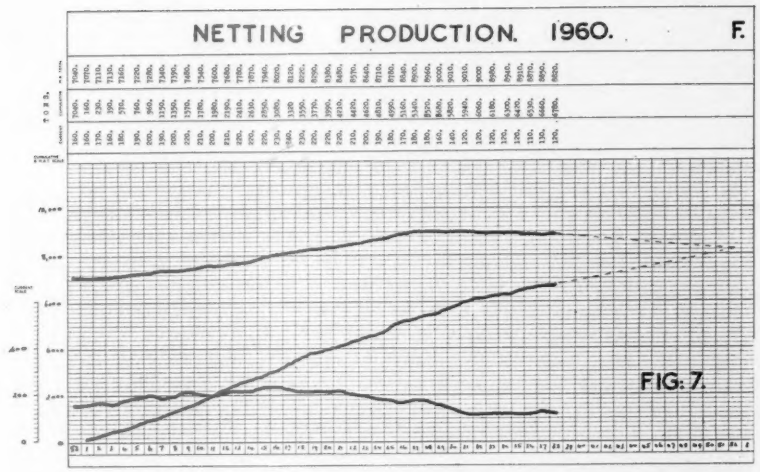


FIG: 7.

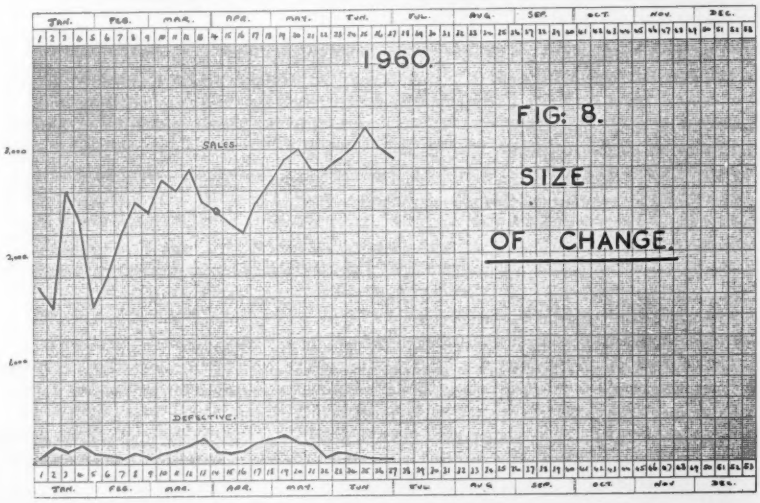


FIG: 8.

SIZE

OF CHANGE.

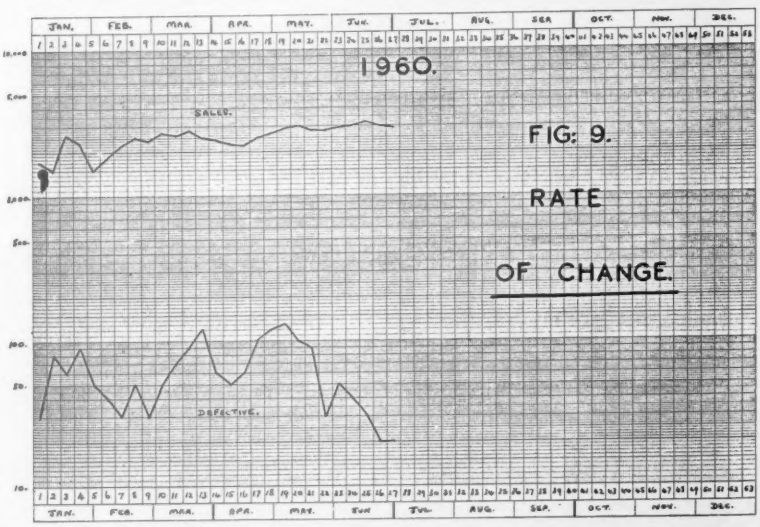


FIG: 9.

RATE

OF CHANGE.

Progress Charts (Logarithmic)

Let us now consider the use of the Logarithmic type of chart better known as a "rate of change" graph. The difference between the arithmetic and the logarithmic scales is pronounced and completely distinct. Neither can be used for the other and it is essential that the workings of both types are thoroughly understood.

* * *

We are only concerned in this case with graphs produced on a semi-logarithmic paper, i.e. a logarithmic vertical scale and a horizontal scale in equal divisions on a time period basis.

* * *

Double logarithmic paper is seldom, if ever, used for plotting statistics. Semi-logarithmic paper can be as many as 5 banks in the vertical but it should be remembered that each bank is 10 times larger than the one immediately below.

* * *

It should now be evident that if we plot a set of figures on logarithmic paper they immediately appear as ratios because the distance between say 2 and 4, 2½ and 5, 4 and 8 etc., are equal as

(*Please turn to page* 1720)

The Story of Aluminum Insect Wire Screening

by Peter M. Miranda, Secretary
Insect Wire Screening Bureau
New York, New York

In this article, the author describes the start and development of the insect wire screening industry, with particular emphasis on aluminum wire cloth.

Not too many years ago, insect protection was pretty much a matter of horse hair and mosquito netting. The bugs had it easy.

* * *

Today, over twenty American concerns manufacture nearly half a billion square feet of aluminum screening annually to protect homes and buildings throughout the country. This is bad news for the bugs, but the aluminum screening industry is doing well and promises to do even better in the future.

* * *

Principally bought for protective reasons, now more than forty states have laws requiring screen to be used in hospitals, food handling plants, dairies and restaurants. Aluminum insect wire screening has developed into a durable product refined through years of technological development.

How It Began

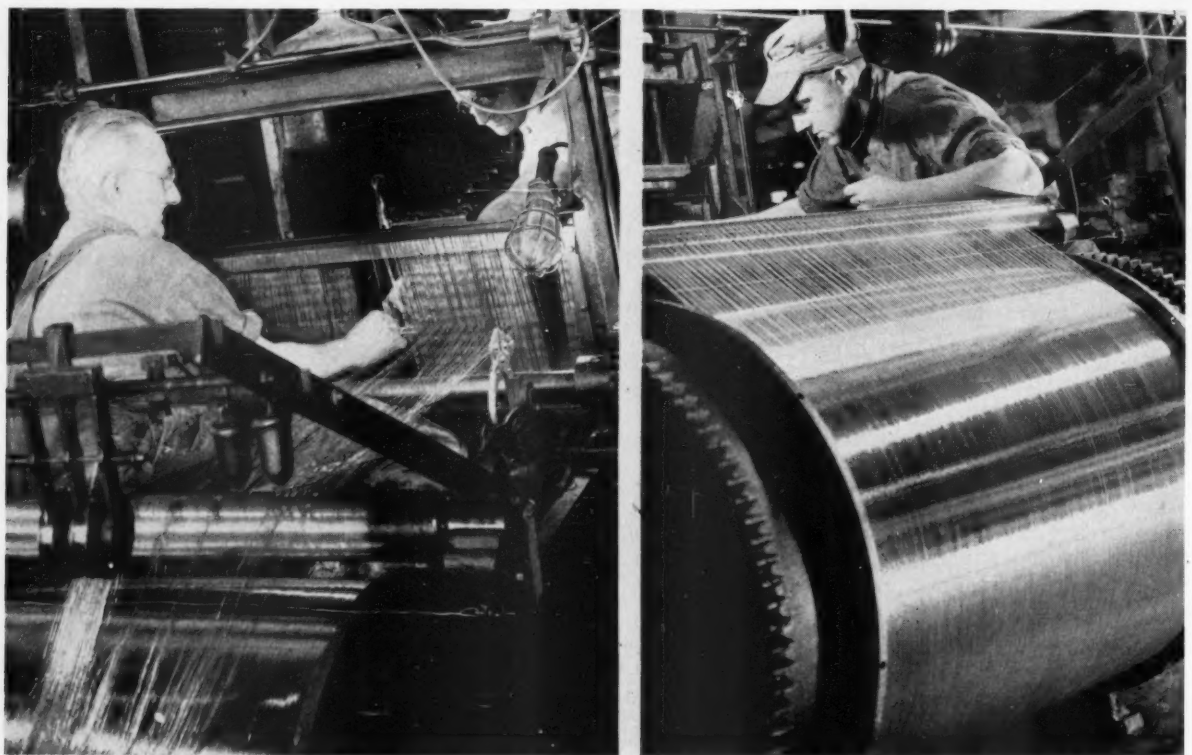
The evolution of today's screening began several generations ago in the town of Clinton, Massachusetts. There, in the 1850's, a local corporation developed a loom for weaving wire into "cloth" and received U. S. Patent #18320, the first patent issued in this country for wire window screening. From this beginning, aluminum screening has developed through continuing industrial effort into today's widely used economical product.

* * *

The advent of World War II provided opportunities which led to important advances in the structure of aluminum wire. At that time, practical experience with aluminum alloys in many fields and extensive laboratory research concentrated on screening itself, developed a new concept known as "5056" clad aluminum wire.

* * *

The core of this product is composed of one aluminum alloy chosen for strength and good drawing and weaving qualities, while the outside is clad with a different alloy designed to protect the core.



LEFT: Each individual aluminum wire is threaded by hand into the weaving equipment. RIGHT: The "mandril" is seen here in operation, threaded to the entire width of screening to be woven. * * * * * * * * * * * * * * * * *

A Protective Cladding

The cladding cannot be seen as two separate sections, because the cladding alloy is applied around the billet before it is rolled into rods and drawn into wire. A metallurgical bond is perfected between the two segments, and results in a high strength wire, resistant to corrosive atmospheres.

* * *

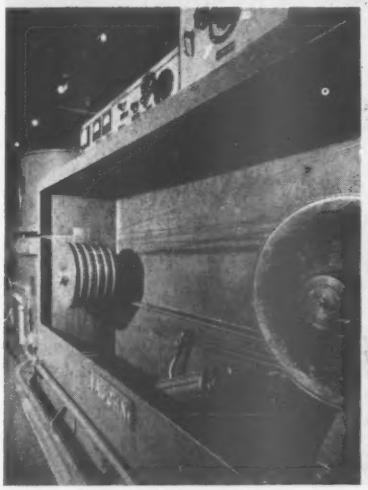
The wire is woven by machine into screen mesh, which, although produced by a variety of concerns, appears much the same to the untrained eye. This is true because the metal weaving industry follows Commercial Standard (CS138-55) issued by the U. S. Department of Commerce. Deviations in composition, substandard, or second quality screening rarely reach the market.

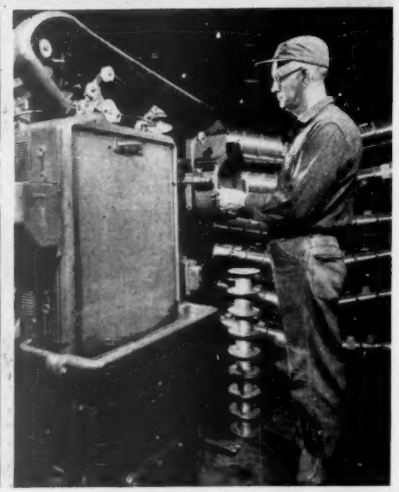
* * *

The most popular mesh counts—determined by counting openings for intervals of one linear foot and dividing the result by twelve—are 18 x 14 and 18 x 16 mesh. The 18 indicates the number of vertical wires per inch, 14 or 16, the horizontal. Differences that occur do so in the "selvage," or edge of the wire screening, which is finished to eliminate ravelling. The selvage differences result from the type of loom used.

* * *

Recently, high speed looms have been developed which feed filler wire through a shuttleless hollow shaft into the loom, and individual mesh characteristics can be seen in the new "tucked edge" selvage. These differences do not affect the finished product.





UPPER: Aluminum ingot, cast by primary aluminum companies, goes through many rolling and "drawing" operations until rod in coils is produced as shown here. At one point during rolling, a special alloy sheathing is placed around the aluminum and becomes metallurgically bonded to it serving as a highly protective cladding. * * * * *

LOWER LEFT: The rod is fed into drawing equipment such as this and is literally pulled through a series of diamond dies with progressively smaller openings. This reduces the rod to an intermediate wire diameter. * * * * * * * * * * *

LOWER RIGHT: The intermediate wire is next drawn through another series of smaller dies in fine wire drawing equipment until the exact size is achieved. The current government standard for the industry specifies aluminum wire for screening with a diameter of 0.011 inch. The fine wire is wound on spools ready for use in weaving screen mesh. Some weavers produce their own wire and others purchase it from outside sources. * * *

The Process

There are, however, many complicated steps to be taken before the clad wire is woven. The process begins with coils of aluminum rod which arrive at the wire department by truck or rail. Here the rod is drawn time and again through diamond dies with progressively smaller openings until it becomes "fine" wire of the exact dimension required.

* * *

The fine wire for weaving is wound on individual spools and placed on "warp racks." From here, a large drum or "warp beam" winds the wire in a delicate operation which insures that subsequent unwinding into the loom will occur without snags or friction.

* * *

At this point, machinery yields to individual craftsmanship as each wire is threaded by hand. The number of warp wires in a "run" produce about 4,000 linear feet of screen. Splicing of this wire is seldom necessary except in rare cases of accidental breakage. On the other hand, short filler and cross wires, subject to bobbin limitations, must frequently be renewed.

High Speed Weaving

The modern loom, prepared with wire for the weaving process, differs in many ways from the ancient hand looms once used for textiles, but in principle, they are much the same. Bobbins still move across the material, but today's high speed components shoot back and forth fourteen or sixteen times to the inch as the warp wires unwind at constant speed from the

(*Please turn to page* 1718)

Major Breakthrough In Die Making Machinery

The die is the heart of wire drawing machinery and the machines can be no better in the production of good wire than the dies that are used in them. In this article new machines for the making and finishing of dies with precision contours and surfaces are described.

Something really new in the field of Servicing and Refinishing tungsten carbide wire drawing dies has been developed by the Engineering Dept. of the Dykrex Corporation of America, located in Montclair, New Jersey (a suburb of Newark and New York City).

* * *

The new Dykrex machines for both round and shaped dies embody the first major changes in Die Refinishing in twenty-five years.

* * *

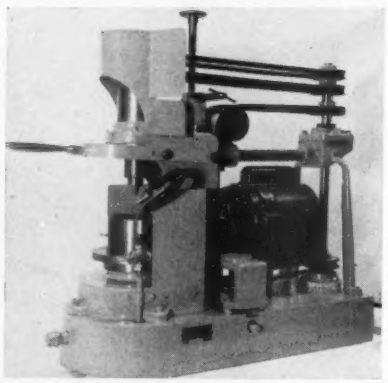
Oldtimers will remember the Roos Tool Company's machines, dating back to the introduction of the carbide die to the Wire Drawing Industry, which revolutionized wire drawing machinery—and the production and quality of wire products. Roos machines, because of their ruggedness and design, became the standard of the Wire Industry.

* * *

With the passing of the Roos Brothers, the firm name was changed to Dykrex Corporation of America, and under the guidance of Messrs. **Gustav Peterson** and **J. Gordon Kaveny**, the firm initiated, developed and has produced a complete line of quality and precision machines that have Worldwide recognition among the Wire Mills.

* * *

Even the famous Roos Ripper, which takes the rough cored carbide nibs and grinds them to appropriate size, has gone 'Automatic'. The new Automatic rippers are made with one, two or three multiple spindles, and in light and heavy duty models for every size of round tungsten carbide dies.



Model HD-3 Ripper * * * * * *

* * *

Not only do these new automatic rippers do the 'ripping' in a fraction of the time required by the old style 'push up' rippers, but one operation now can operate two 3-spindle rippers with LESS energy because they are push-button and lever-operated controlled, replacing six (6) operators and are doubling the production of rough finished dies.

* * *

Then follows the finishing or polishing of the die on one of the many types of Dykrex semi-automatic and automatic polishers. It is in this operation that these new polishers have advanced the art of re-finishing dies to a precision science, with push-button controls that take the guess-work out of die polishing and turning out perfectly contoured dies in a fraction of the time of older machines.

* * *

The new Dykrex polishing machines are made in a variety of models and base lengths, from 24 to 36 inches, and in die casing sizes from one to seven inches. Set-up time is negligible; the fine finishing with ground diamond powder is done in a matter of minutes—more than doubling die production over previous procedures.

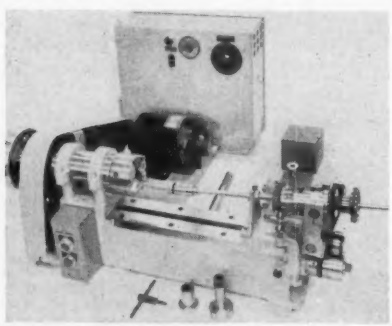
* * *

The patented Roos pressure feed to the rotating spindle has been retained in the new Dykrex Polishers.

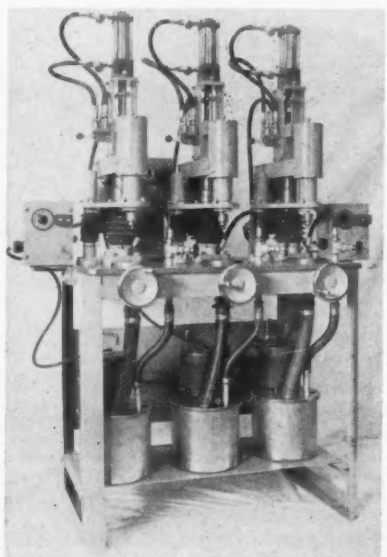
* * *

Coupled with starting push-buttons is a timing switch that shuts down the machine automatically

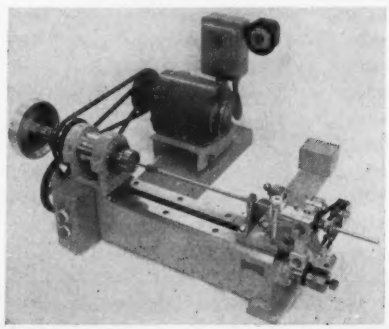
(*Please turn to page* 1736)



Model MX-2 Polisher * * * * *



Model LDR Ripper * * * * * *



Model M Polisher, 24" base * * * *

MICROMETER PRECISION MICRO-WELD ®

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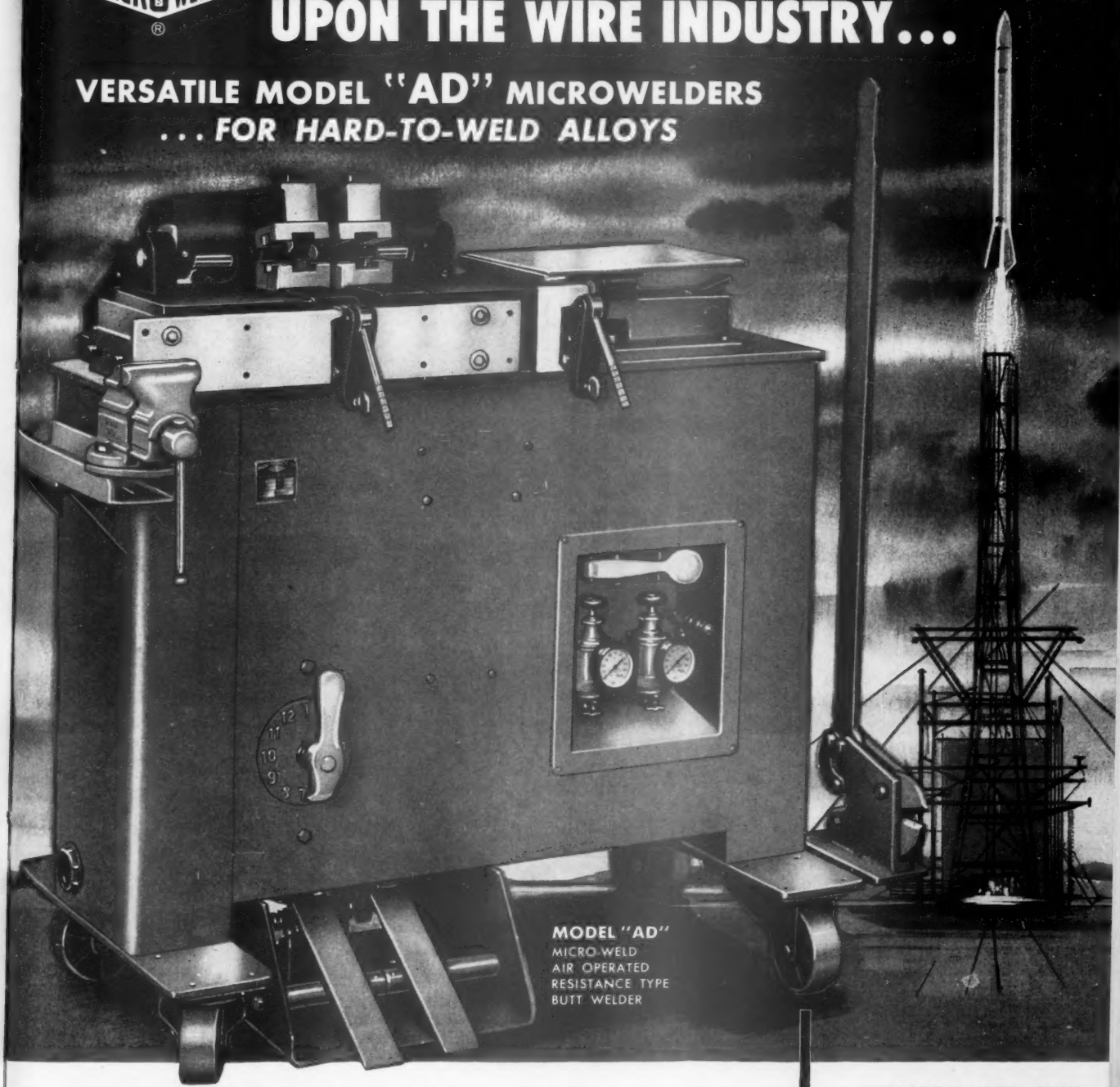

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Proper Lubrication and Its Relation to the Service Life of Wire Rope

by Peter W. Sherwood
Research Engineer
White Plains, New York

Wire rope is one of the work horses of industry. Its proper lubrication is a matter of concern both to the manufacturer and user.

In service, wire rope is usually a part of moving machinery and, in the course of its use, the individual wires, the strands as well as the core are exposed to changing forces and to frictional effects. For these reasons, the rope is lubricated by the manufacturer. To assure long serviceable life of the rope, it is essential that the user maintain the rope in well-lubricated condition.

* * *

Wire rope lubrication serves two main purposes: (1) to prevent internal corrosion and deterioriation which cannot be properly evaluated by external inspection, and (2) to save cost and time of maintenance or replacement of both the rope and its associated equipment, such as sheaves, drums, etc.

* * *

Corrosion in the wire rope is doubly harmful. It decreases the diameter of metal in the individual strands. Furthermore, it leads to the formation of "red dust" or "red rouge" (i.e., powdered rust) which is lodged between the strands and increases the extent of abrasion, thus accelerating the loss of metal even further.

Effect of External Lubrication

The core of new wire rope normally contains between 12 and 15% lubricant. The oils which are originally present in the rope are partly deteriorated by oxidation and partly squeezed to the surface under changing tensions and stresses. Once the oil reaches the rope's surface it is eventually eliminated by wiping action, or it is rendered useless by mixing with dirt.

* * *

The concentration of lubricant in the core of improperly maintained wire rope may therefore be reduced to values as low as 2.5%. Even under ideal conditions, however, internal lubricant concentration is reduced below the initial 12-15%, as compacting decreases the available space around the core fibers.

* * *

Eventually, therefore, the amount of oil present in well-lubricated wire rope is reduced to 8-12%. This appears to be an equilibrium concentration. One rope engineer has studied core lubricant concentrations of used wire ropes which contained initially as little as 2.6% and as much as 13.5% oil. In the course of use, both types of rope core were eventually found to have a lubricant content of 8.1 to 11.2%, provided that external lubrication was applied. In the absence of external lubrication, however, the concentration of oil in the rope core dropped to approximately 2.5%.

* * *

Accompanying this decrease in core lubricant was a significant decline in the useful life of the rope. He thus was able to show quantitatively that external lubrication of wire rope has the following effects:

1. **It maintains the equilibrium lubricant concentration of the rope core.**
2. **It preserves the core fibers for a longer time, thereby maintaining the rope in good working condition.**

* * *

Furthermore, it has been shown that external lubrication during use greatly reduces internal friction between component parts of the rope as well as between the rope and equipment to which it is applied. This results in better internal and external condition of the rope and reduces occurrence of wire fatigue with resulting increase in rope life.

Finally, it has been established that dry fiber core has a tendency to absorb moisture from the air with resulting increase in corrosion rate. This tendency, too, can be suppressed by supplying an adequate amount of lubricant during use.

Methods of Lubricant Selection

A large rope manufacturer lists the following requirements on field lubricant for wire rope:

1. **Compatibility with the lubricant on the rope from the time of manufacture.**
2. **Penetrating qualities.**
3. **Adhesive and cohesive properties within the full range of operating temperatures.**
4. **Good lubricity.**
5. **Suitability to field application without elaborate equipment.**
6. **Corrosion inhibiting properties.**

* * *

Proper choice of lubricant is greatly influenced by service conditions. Temperature, extent of friction and abrasion, and atmospheric conditions to which the rope is exposed, vary widely. While visual inspection at simple test conditions has long provided a crude guide to a particular lubricant's suitability, user and manufacturer have had to rely on field information for quantitative evaluation of a lubricant's adequacy in a given service. Recent work by other wire rope manufacturers has, however, led to the development of some fairly simple bench tests by which many of the field characteristics of wire rope lubricant may be predicted with good accuracy. The following key characteristics may be checked in this fashion: (1) Ability of the lubricant to cling to the wires without dripping or flowing from the rope at high temperature; (2) low-temperature be-

(*Please turn to page* 1714)

Report on An Advanced Contribution to Diamond Die Finishing

by Howard F. Simmon
Fort Wayne, Indiana

The author, who has worked as a diamond die finisher, describes a new needle he has developed that besides speeding the cutting and polishing of diamond dies, produces a more accurate die contour.

Unless one has actually seen the workings of a diamond die finishing machine, there is bound to be some difficulty in picturing my process of diamond die cutting, or to be fully aware of the completely successful application and significance of what I call the "special needle". Diamond Die Finishing is a unique trade. Moreover, as now practiced, 80% of the work and time that goes into it is more or less trial and error, or is largely "by guess and by gosh".

* * *

The discovery and development of the "special needle", came as a natural outgrowth of a question that plagued the writer: "Why can't all this guesswork and trial and error be eliminated?" This is exactly what the new process does.

* * *

Since this work is highly specialized, a few comments may be in order.

* * *

Haphazard methods of diamond die finishing are more the rule in this industry than the exception. If one visits some of the die shops, the poor working conditions that prevail will be noticed: poor lighting, inadequate tools, and a lack of any signs of progressive management; one well might ask: "Is this American know-how?"

* * *

It is hardly an exaggeration to say that half the die shops don't know how to make a good diamond die, and many orders are rejected and a lot of dies are returned as entirely unusable. It is something the Russians shouldn't know about. This happens to be important and relevant to the subject, and will serve to illumine some important facts a little more when the description of the "special needle" in cutting diamond dies is given further along.

There appears to be a prevalent "don't-care" attitude in this business among the workers, too. This largely is because the tools with which they are provided are inadequate, the machines they run are dilapidated or antiquated, and the lighting systems are very poor in view of the nicety of the precision work that must be done to turn out good diamond dies.

* * *

It takes a lot out of a worker in an eight hour stretch when he finishes six or eight passable diamond dies a day working under such conditions especially. Patience and nervous energy, the maximum of both, are required to be expended in this work even under the best of conditions in the shops that are progressive.

* * *

A diamond die finishing machine has twelve cams on eccentric gears upon the background of a suitably long, wide plate of thick steel set upright and elongated, against which these cams swing in unison from side to side on approximately a 45° angle. Fastened upon the front of these cams are devices that have flat, round 'heads' that spin very rapidly. Upon these discs or 'heads' are placed the dies whose diameter is mostly a bit less in size.

* * *

Dies are stuck on here with beeswax very effectively. They have to be centered perfectly on the 'heads', for directly above the die-hole in the center of the die-casing is a spindle, or long rod, about ½ inch in diameter, perpendicular to th flat surface of the 'head' and of the die thereon. Simultaneously while the die is spinning in one direction, the spindle above spins counterwise. And at the same time the cams are swinging the dies first to one side, then over to the other, equidistant from the center position, and with a smooth and regular motion.

* * *

A small specially made chuck tightly holds about a 6 inch length of music wire. This wire is a highly tempered spring steel. Various gauges of music wire are employed, the size of the die-hole in the diamond at any one point determining the exact size of wire to be used for the purpose of spreading the abrasive diamond powder around in the die-hole to cut the diamond. About ½ inch of one end of the piece of wire is inserted into the small chuck, before mentioned, as it is provided with a center hole drilled through it to accommodate it and, by tightening side-inset Allen screws against the wire, it is securely held in place. Two simple bends, down across and up again, and then a tapering point is ground on the wire-end. The music wire has thus become a springy needle, which is the instrument whereby the diamond die is cut and polished, used in conjunction with diamond dust mixed with a little olive oil or other carrier. The chuck fits up into a hollow portion of the spindle and the point of the needle rests in the tiny hole drilled in the diamond die's center.

* * *

How fast do these needles cut? Well, that is the guesswork. How is the die shaping up? That is the trial and error.

* * *

For, you see, when a 'finisher' gets a die, at the start it may have only a .011 to .016 hole drilled

(*Please turn to page* 1718)

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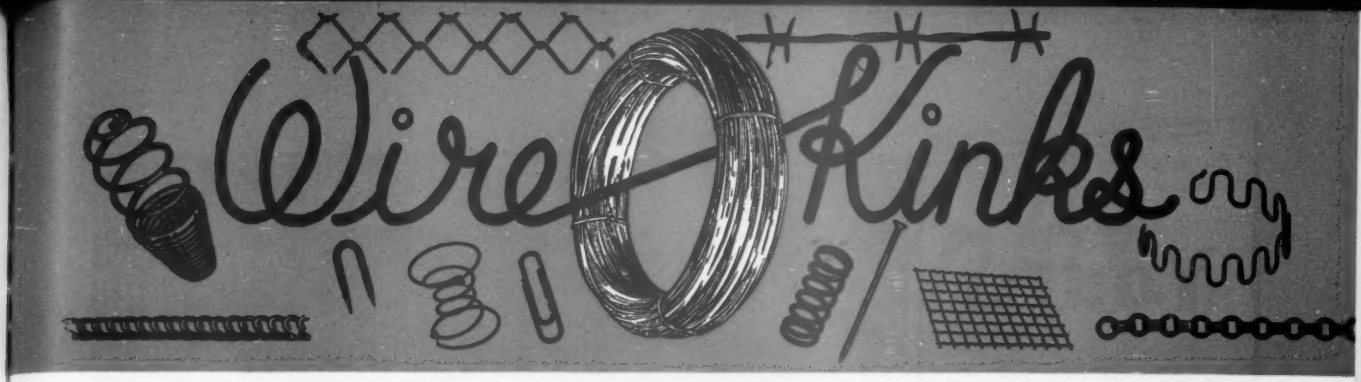

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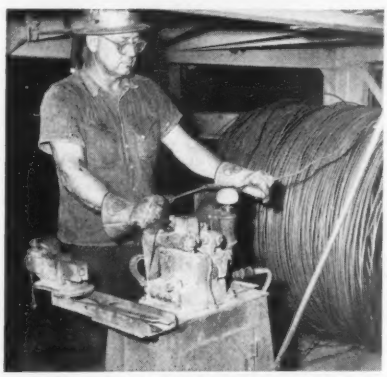
Butt Weld Flash Removal

A common problem encountered by the users of butt welders in wire mill operations is the removal of the resultant flash so that the welded wire may be further processed. Usual method was by hand filing which was tedious and time consuming.

* * *

Al Watson, foreman of the wire drawing department at the Hous-



ton works of **Sheffield Division** of Armco Steel Corporation, asked a grinding wheel maker to manufacture a modified spherical stone mounted on a ⅜ inch spindle.

* * *

He mounted an air motor in a vertical position to the butt welder frame. With this stone and motor and a foot operated air valve, it is possible for the operator to have both hands free to grind off most of the flash in a single pass over the grindstone. A slight flexing of the wrists completes the job in a matter of weld and grind a splice. He can seconds.

Cross Wire Welding of Mesh

QUESTION

What are the welding characteristics of various metals in making welded mesh?

ANSWER

Clean low carbon steel wire has accounted for most of the mesh production since the making of welded wire mesh was started and it is the most easily welded metal.

* * *

High carbon steels up to 1030 do not present any great difficulties, but the higher the carbon content, the more difficult it is to weld because of the greater brittleness in the welds. While they may be welded, some type of post-heating cycle is desirable to normalize the welds and keep them ductile. On the conventional welder it usually is necessary to run the machine slower to provide the time to use lower heat values to obtain an anneal cycle. This cuts production and increases costs per unit.

* * *

Stainless steel is one of the high strength alloys that is welded easily. The higher electrical resistance of stainless steels allows the use of lower values in the electrical current. However, due to the higher heat hardness, greater pressures are required to effect satisfactory cross wire welds. It can only be done on machines that are designed to provide sufficiently high pressures.

* * *

Low alloy steels in general can be welded without too much difficulty, except that here, too, the pressures have to be higher than for low carbon steels. Those alloys that have air hardening characteristics require longer welding time, which, in most cases, will produce satisfactory welded joints.

* * *

Aluminum, because of its softness, is difficult to cross wire weld, except under almost laboratory conditions. For this reason, conventional mesh welding equipment is not considered satisfactory for aluminum wires. Were cross wire welding done, it would require closely controlled individually adjusted pressure, weld current and weld time for each single cross wire junction, and could hardly be an economical operation. This is not to say that individual welds cannot be made on many products, but that it is impracticable for the simultaneous, multiple welds that must be made on a mesh welder.

* * *

Other non-ferrous alloys, such as brass and bronze, are readily welded, although the lower the conductivity of the alloy, the easier it is to weld. In general, non-ferrous alloys, because they have higher conductivity than steel, require higher weld current values. Lower pressures also are used.

* * *

Rust on steel or heavy coatings of drawing compounds remaining on the wire can affect the quality of the weld, although ordinarily light oil coatings will not affect resistance weld quality.

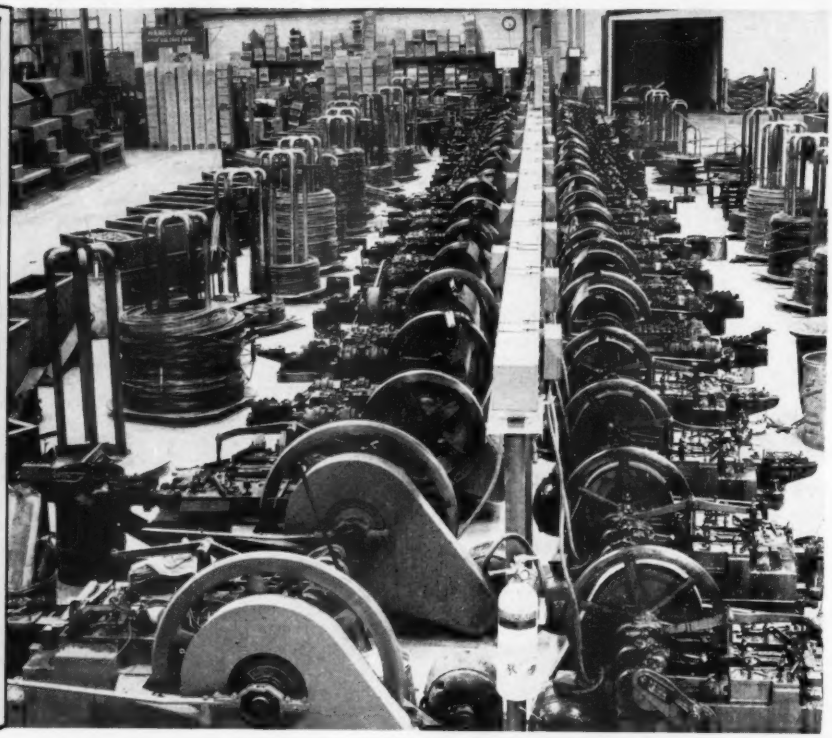
Ancient Roman Nails Are Rust Resistant

In the June, 1961, issue of WIRE AND WIRE PRODUCTS, on page 769, there appeared an item under the above caption.

* * *

A letter from **G. T. Brown,** Applied Metallurgy Section, G.K.N.

Your Key To Profits



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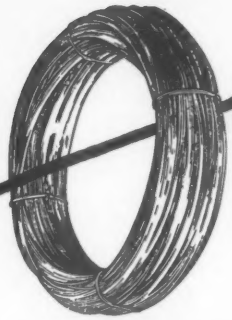

Group Research Laboratory, Wolverhampton, England, takes issue with some of the statements and provides additional information on the nails in question. Mr. Brown's comments are quoted below.

* * *

"I was intrigued to note that a comment on some Roman Nails ("Wire Kinks", June, 1961) found in Scotland had reached you via a German translation.

* * *

"I am afraid I must express some measure of disagreement with the comment however. The fact that there were 12 tons has a lot to do with their condition, those on the outside of the hoard had indeed rusted heavily but had afforded protection for those underneath.

* * *

"At present these nails are being examined in detail by a number of people, myself included, and we are hoping to publish the results early next year. So far it is apparent that the structure of the nails is very similar to that of other iron objects of a similar vintage, i.e., they consist of a number of pieces of iron of carbon content ranging from virtually nil to about 0.8% all welded together by forging. The shanks were forged to a point first and headed last. There is some evidence that a die was used in head forging.

* * *

"In many cases, particularly the smaller sizes, forging scale is intact and others have adhering shiny black slag particles. It is this which has tended to be over-emphasised and gave rise to the belief that their corrosion resistance was somehow exceptional. The corrosion aspect is being investigated and, as stated, will be reported, with other findings, in the near future."

Use of Isotopes in Wire Production

QUESTION

We read about the increasing use of isotopes in industry and I am wondering whether any applications have been found for them in the wire field.

ANSWER

The use of radio-active materials or isotopes in the wire industry is still in the experimental stage. Some use has been made in this country and research in England and Germany is in progress.

* * *

So far, they have been found particularly suited to assessing the wear on wire drawing dies. In these tests, radio-active tracer techniques have been followed. Tungsten carbide dies have been irradiated so as to produce certain tungsten and cobalt radio-isotopes.

* * *

The wire picks up the irradiated particles from the radio-active dies and is studied to determine the degree to which the die debris materials have been rubbed off onto the wire in the drawing process. Since preliminary radiography showed the die wear to be erratically distributed, a counter method was developed to integrate the radio-activity of each length of wire.

* * *

The technique also is used to assess the friction-reducing properties of wire drawing lubricants, since it is obvious that the better the lubricant, the less will the dies wear.

* * *

Autoradiographs have revealed three distinct types of wear deposits:

a) **Fairly uniform wear deposits on the wire, attributed to cobalt.**

b) **Discrete spots of greater intensity occurring singly or in groups, attributed to particles of tungsten carbide.**

c) **Groups of uniformly distributed discrete spots, extending over about an inch of wire that occur occasionally. These are considered to be tungsten carbide particles.**

* * *

While the technique is young, it can have definite value in determining the degree to which die wear occurs, since while the wear particles are minute, they are measurable. Probably a most important value will be the ability to assess the effectiveness of the lubricants used.

Flat Wire

QUESTION

Can you supply information on the making of flat wire and the way to determine the size of round wire to be used in rolling to specified sizes?

ANSWER

Flat wire may be divided into two broad categories:

a) **Flat wire having a definite carbon content and tensile strength that is used for driving chains, springs, screw nuts, etc.**

b) **Flat wire possessing a high degree of ductility suitable for forming, shaping and bending.**

* * *

Flat wire, in the first category is produced by rolling to the finished size in which it becomes work hardened. The specifications of the finished product determine the selection of the wire or rod stock's

(*Please turn to page* 1727)

ABSTRACTS

These abstracts are published through the courtesy and with the permission of the Industrial Diamond Information Bureau, 2 Charterhouse Street, London, E.C.1, England. Inquiries regarding them should be directed to the Bureau.

Dura tungsten carbide dies and tools, Adelphi diamond dies

Wire Drawing Dies (Manchester) Ltd., Adelphi Ironworks, Salford 3. 12 pp, 7 x 9 in., illustr

Photographs with captions indicate various stages in diamond die manufacture. All stones are individually chosen to give maximum wall thickness round the bore and to ensure freedom from flaws that might lead to premature failure. The selected stones are specially reinforced to give added support. Tungsten carbide dies and tools are also specified. The company runs a die maintenance service.

Diamond belts cut die-polishing costs

Chase Brass & Copper. *Amer Mach* 1960 Vol 104 (16) pp 74-75 (Aug 8)

Hand polishing of large carbide drawing dies used to take from 2 to 6 h but polishing can be done in as little as 15 min by a diamond belt method, while overall costs are claimed to have been cut by a ratio of 50 : 1. Dies of sizes from ⅜ to 8 in. diameter can be serviced by belts ranging from 3/16 to ⅜ in. in various grit sizes. Belts are impregnated with 100, 200, or 300 mesh natural diamond grits and are water cooled. Average life has not been determined because of the difference in amount of carbide removed at each job, but up to 200 dies have been serviced by one belt. 1 illustr.

Dies made from Yakutian diamonds for the drawing of fine wire

G. P. Gvozdyk. *Stal* 1960 (7) pp 528-529 (July) (In English, original in Russian)

Data on the workability of Yakutian diamonds and on the durability of dies made from them for drawing fine wire are compared with data on stones imported into Russia for this purpose. Tables show weight losses during manufacture and time taken to make one diamond die. It was concluded that losses were smaller when manufacturing dies from Yakutian stones than from imported diamonds, *ie* 25.2% instead of 35%, and this is said to be explained by the better geometrical shape of the former. It is also stated that life of dies made from Yakutian diamonds is 3.3% higher than life of dies made from imported diamonds. 2 tables.

Review on the International Machine Tool Exhibition, Olympia, London

Anon. *Wire World Internat* 1960 Vol 2 (4) pp 186-190 (Aug)

The 'BEER' Drawing Die Grinding and Polishing Machine uses an endless abrasive band guided through the die aperture by means of guide rollers, which are adjustable both vertically and horizontally so as to allow the abrasive band to follow the curve of the die. The machine, designed to operate in the direction of the draw, can be used for grinding, lapping, or polishing hardened steel and tungsten carbide dies with inner diameter of 5/16 to 12 in. and outer diameter up to 19 inches. The Thiel diamond filing machine for filing and lapping tungsten carbide dies is also described.

The fundamentals of wire drawing II: The size of the pellet

C. P. Bernhoeft. *Wire Industry* 1961 Vol 28 (329) pp 481, 483-484 (May)

During this extract from the book of the same title, the author states that all wire sizes under 0.03 in. diameter should be drawn with diamonds and above with tungsten carbide dies. Theoretical and practical pellet sizes, and the reasons why they are adopted are described. 7 illustr, 2 tables.

Special machine for hot-drawing molybdenum wire

VEB Drahtziehmaschinenwerk, Gruena, Germany. *Machinery, Lond* 1961 Vol 98 (2531) p 1124 (May 17)

On the UDZWGW/VIII/8, there is provision for a maximum of eight diamond dies, each giving a reduction in area of 13 per cent. Drawing speeds are steplessly varied from 65 to 262 ft/min. and heating is effected, by resistance with a 16V current to provide temperatures from 500 to 750 degrees. 1 illustr.

The fundamentals of wire-drawing. 12—The drawing of fine wire on slip-machines

C. P. Bernhoeft. *Wire Ind* 1961 Vol 28 (330) pp 591-592 (June)

Points out that there is a very great difference in wear between tungsten carbide and diamond dies, therefore diamond should always be used when drawing fine wire. A method is given for evaluating what die angle should be used in diamonds having such small bores. 1 illustr, 4 tables.

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Hot extrusion
R. Cox. *The Prod Engr* 1961 Vol 40 (6) pp 401-414 (June)

Experience gained in the hot extrusion of titanium, zirconium and cobalt base alloys is described. Dies and die blanks must meet many requirements in this process, especially when difficult sections have to be produced and, it is stated, an ideal die material is still to be developed. 16 illustr, 2 ref.

"Universal dies"
V. V. Shevelev reviewed by L. P. Obozov. *Kuz-shtam proizv* 1961 Vol 3 (2) p 47 (Feb); *Library of Congress Mthly Index Russ Access* 1961 Vol 14 (1) p 172 (Apr)

A machine-shop for carbide dies
Belgian Tool Co, 55 Rue Leopold, Malines, Belgium. *Wire Ind* 1961 Vol 28 (328) p 378 (Apr)

The Malines Universal Complex machine is made up of three parts. The M-U 61 ten-spindle machine drills, rips, reshapes, and recuts tungsten carbide dies, whether set or unset. The ten spindles are entirely independent. The machine can pre-polish the dies with boron carbide, and the type BP-61 polishing head uses diamond paste to reach fine size in a few minutes. The TB-61 needle grinder re-sharpens needles, pins, or broaches to the required angle, and supplies the number of regrinds required to feed the fast working ten-spindle machine. 2 illustr.

Cleaning fine wire drawing dies. Ultrasonic cleaning methods are applied
J. W. Cowan. *Ultrasonic News* 1960 Vol 4 (3) pp 10-15 (Fall); *Battelle Technical Review* 1961 Vol 10 (2) p 190 (Feb)

New High Speed Flattening Mill

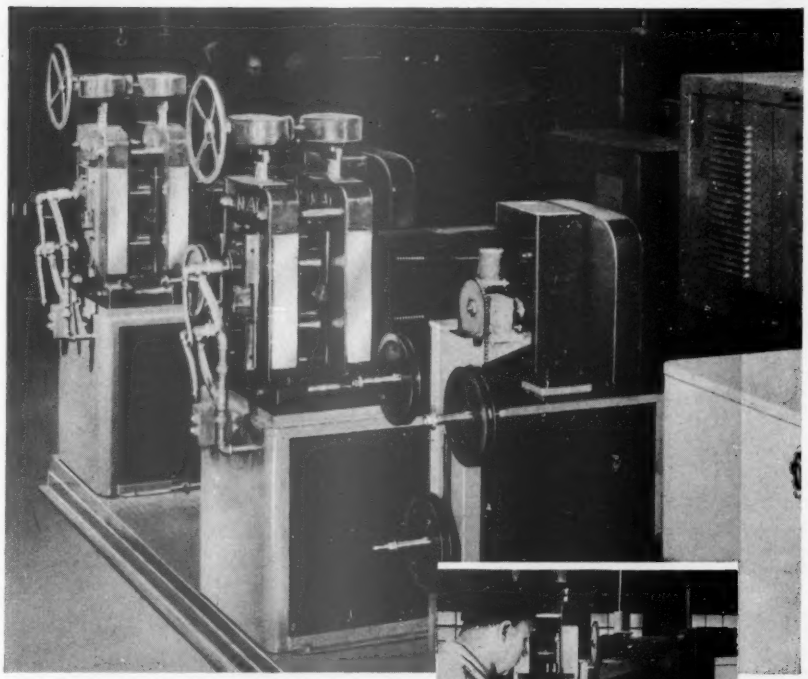
Now in operation at the Wallace Barnes Steel Division of Associated Spring Corporation in Bristol, Conn., this new Fenn three-stand precision roller bearing wire flattening line will produce "tailor made" spring steel at speeds up to 3100 fpm. The line is equipped with every feature and accessory for precision operation from a single control console.

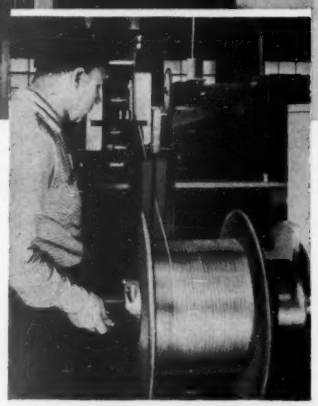
* * *

This mill, Model 082-062-062, has three stands on a common base. The first stand is equipped with 8" diameter carbide shell rolls; the second and third stands have 6" diameter carbide shell rolls.

* * *

Other mill features include ten-roll friction straightener on entry side of first mill stand, electric screwdown on all stands, internal and external coolant supplied to mill rolls and coolant troughs from common reservoir located within mill bed, automatic self-contained lubrication system, Pratt & Whitney width and thickness gages mounted at exit





HIGH PRODUCTION *Wire Flattening* **MILLS**

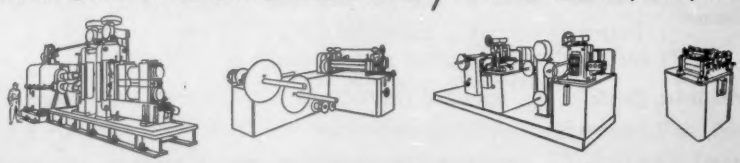
Now you can get extremely close tolerances combined with high speed production, with Stanat Wire Flattening Mills. These Stanat mills can be used to produce a wide variety of flat and shaped wire.

Designed to offer maximum flexibility of operation and arrangement, Stanat mills are available either as completely self-contained package units or as individual components for erection at your plant.

Stanat wire mills are available in 4", 6", 8" and 10" roll diameters, with optional equipment to fit your individual production requirements.

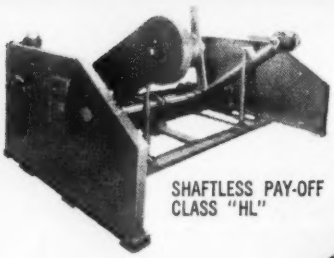
■ Find out how you can get increased production and greater profits with Stanat Wire Mills. Write today for further information.

STANAT MANUFACTURING CO., INC. / 500 SHAMES DRIVE WESTBURY, L. I., N.Y.



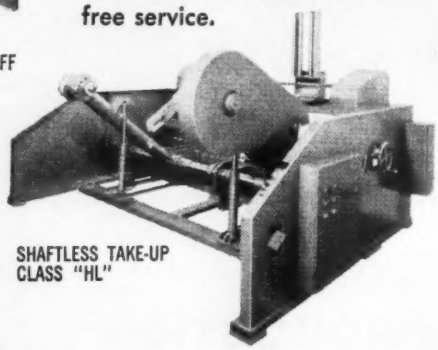
MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

ALL STEEL CONSTRUCTION SHAFTLESS DESIGN



SHAFTLESS PAY-OFF
CLASS "HL"

ENTWISTLE combines features to assure simple, space-saving installation, ease of operation and rugged, trouble-free service.



SHAFTLESS TAKE-UP
CLASS "HL"

ENTWISTLE "HL" SHAFTLESS TAKE-UPS and PAY-OFFS do not require special pits or elaborate foundations.

Pintle arms are pivotted close to the floor for maximum rigidity.

All drives, transmissions, brakes etc. are mounted integral with pintle arms and are within confines of the frame.

Motorized hydraulic lift elevates reels directly from the floor over range of reel diameters specified for each type.

Pintle arms are positively inter-locked for synchronized rate of lift.

Single control moves both pintle arms simultaneously to automatically centralize varied reel widths to the cable pass line.

Reel pintles are interchangeable.

Standard units are available in reel capacities from 48" through 110" O.D. and for weights to 25,000 Lbs. (the full line of ENTWISTLE TAKE-UPS and PAY-OFFS covers reels from 16" through 156" O.D. and weights through 50 tons.)

For further information, ask for specification "HL"

Over 40 years of dependable service

ENTWISTLE Manufacturing Corporation

Formerly James L. Entwistle Co.

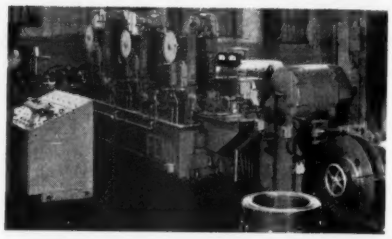
1475 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND

United States, Canada	INDUSTRIAL EQUIPMENT CO.	P. O. Box 706, Englewood, N. J.
Europe, So. America, Mexico	FOREL EQUIPMENT CORP.	165 Broadway, N. Y. 6, N. Y.
British Associates	THE KEMSON ENGINEERING CO., LTD.	Blackburn, Lancs., England

side of last stand and friction edgers with power operated adjusting screws mounted between stands.

* * *

The mill has complete DC electric drive including a new Fenn control circuit. Each mill stand is driven by a 75 HP DC motor. Other equipment includes a new motorized basket type pay-off reel for loose coils. Driven by its own three horsepower DC motor, it has pay-off speed compensation for various first mill



stand reductions. A Fenn Model 20 repass reel pays off from up to 1000 pound coil weights from a three-section collapsible drum at speeds of 2000 fpm. At take-up is a Fenn Model No. 2315 Hydraulic Traversing Take-Up Reel capable of producing traverse wound coils in stock widths up to .500" at production speeds up to 3100 FPM in 1000 lb. coil weights. Unique control system permits extension of speed range with corresponding tension protection.

* * *

Engineered especially for this line is special material handling equipment used at take-up and repass reels. Pneumatically operated, it lifts the 1000 lb. coil free of collapsible take-up drum and removes coil from drum, placing it at floor level if desired. At repass reel, it raises coil to drum height and places it on drum.

* * *

For further information on this equipment, contact John H. Charpentier, **The Fenn Manufacturing Company**, Newington, Connecticut.

Karma Wire Improved

Improved Karma resistance wire with greater long term sta-

bility was introduced to west coast manufacturers by **Driver-Harris Company** of Harrison, N.J. at the Western Electronic Show and Convention in San Francisco in August.

* * *

The principal use of Karma wire is in the manufacture of precision potentiometers and resistors. Driver-Harris will provide complete technical information on improved Karma wre, which has new standard limits for temperature coefficient of resistance of ± 5 parts per million per degree C.

* * *

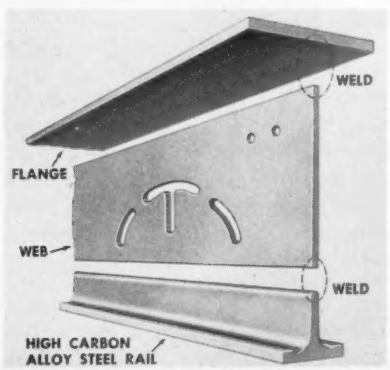
Additional user benefits are (1) negligible change in temperature coefficient (T.C.) after winding and processing, (2) extremely high linearity, and (3) greater tensile strength.

New Heavy Duty Tramrail Track Announced

Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, announces the introduction of "Tarca Track," a new heavy-duty track for overhead materials handling service.

* * *

The result of years of extensive study and testing, Tarca Track has been designed to withstand heavy, swinging, jerky loads and provide a smooth trouble-free road for materials movement. It has been engineered to attain maximum strength with minimum weight. Its construction assures extra years of service over ordinary tracks.



Flange, web and rail are joined by welds that are continuous from end to end of the parts.

For Fungus Resistance, Specify

TEXTILENE TWI-TAR

Offering great durability along with light weight, Textilene Twi-Tar is successfully used for buried communication cable (bedding and overall serving), expanded ACSR cable (expander between core and conductors), stationary power cable and portable cables.

Twitchell's superior Textilene line also includes: Moisture-resistant fillers — *Twi-Flex* and *Twi-Wax.* Used for non-metallic sheathed cable, maritime shipboard cable, varnished cambric cable.

Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all types of portable and flexible cords.

*Patent Applied For

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation — also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E.W. TWITCHELL INC.

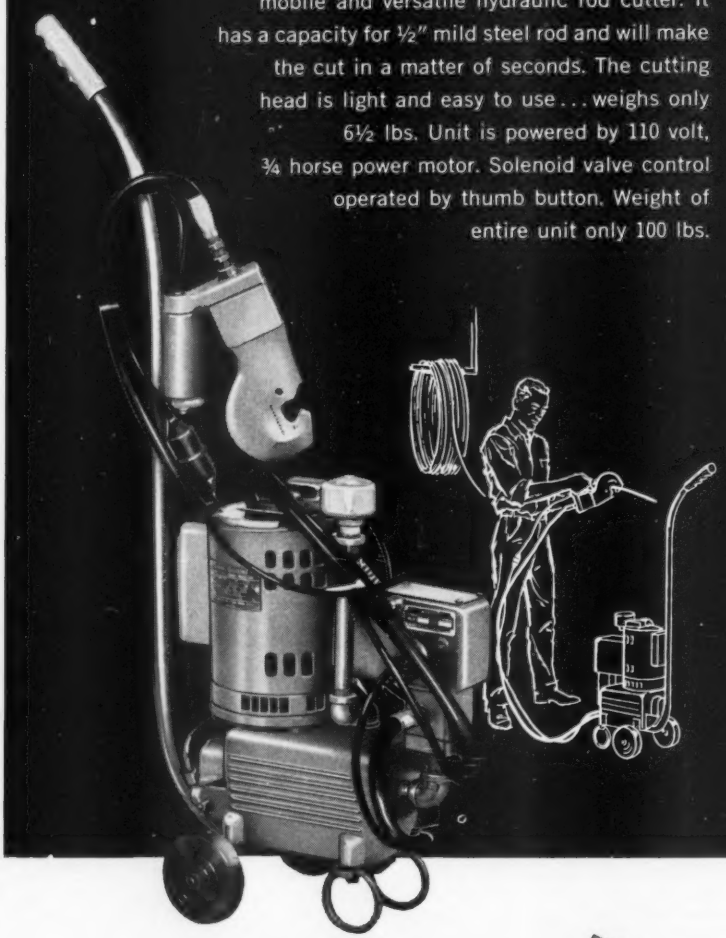
Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

NEW FAST PORTABLE HYDRAULIC ROD CUTTER

IDEAL FOR TAKING ROD SAMPLES AND OTHER CUTTING JOBS. Here is an exceptionally mobile and versatile hydraulic rod cutter. It has a capacity for ½" mild steel rod and will make the cut in a matter of seconds. The cutting head is light and easy to use... weighs only 6½ lbs. Unit is powered by 110 volt, ¾ horse power motor. Solenoid valve control operated by thumb button. Weight of entire unit only 100 lbs.



MANCO offers a complete line of hydraulic cutting tools, punches, rod straighteners. Write for Catalog.

DEPT. W-12

MANCO MFG. CO.

BRADLEY, ILLINOIS

The new track is a compound section consisting of a steel flange and web, and an especially rolled high carbon alloy steel rail. These parts are welded continuously from end to end under carefully controlled conditions to form a combined section free of stress concentrations. The parts are carefully proportioned to produce a perfectly balanced design for loads under all conditions.

* * *

The rail provides great strength and has a hard, flat, raised tread or running surface. This tread is smooth and becomes highly polished in service, assuring continued easy operation of cranes, carriers and trolleys. The hard, raised-tread surface prevents the rail flanges from peening down, so common with low carbon flat flanges, due to continuous rolling action of the wheels.

* * *

Tarca Track is fabricated in a large number of standard sizes ranging from eight to twenty inches deep. Special sizes and greater depth tracks can be made for unusual applications when required. Tarca Track rail dimensions match with existing Cleveland Tramrail track dimensions, permitting extension of all systems now in service.

* * *

Tarca Track fills a real need where distances between track supports are great. For most situations with such limitations, the new track reduces or eliminates the need of an especially engineered structural framework so often required for supporting overhead tracks. As an example, when Tarca Track is used for crane bridges, single-girder three-ton cranes or double-girder five-ton cranes can be made for operation on runways with tracks spaced up to 100-foot centers. This dwarfs old maximum standards and offers a new frontier for the economical solution of handling problems that previously were difficult or very costly.

* * *

These tracks can be used for either hand-power or electrified installations and may be con-

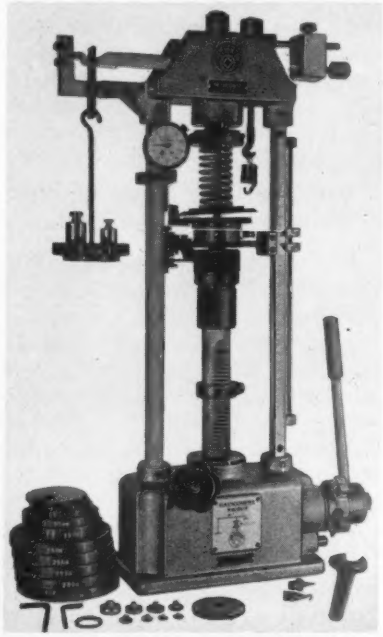
nected to track switches. Systems can be developed for nearly every handling situation requiring straight or curved tracks for all loads up to 20 tons. Standard Tarca Tracks are available in lengths to 60 feet.

New Spring Tester

This new instrument checks both compression and extension springs. Loads are in fractions of an ounce, decimals of a pound or in grams. Lengths are in decimal inches, tenths and thousandths. Squareness of compression springs under load are checked from 0 to 7 degrees.

* * *

A new feature is a hand-turnable collar under the ram platform to produce a vernier movement so small that deflections in thousandths or less can be easily made.



* * *

Another new feature is the removable fixture mounted on the ram platform to check Squareness-Under-Load of a compression spring. It has long been known that a compression spring ground squarely in the free position may tip considerably and exert an uneven pressure when loaded; this causes pressure regulators and valves to chatter and work improperly. This fixture al-

Made to close tolerances!

Apco Mossberg Reels, Spools and Bobbins are designed and manufactured to precise specifications to assure a true arbor for smooth spool-out at high speeds.

An all steel construction that won't gouge or burr reduces machine down time and maintenance to a minimum.

Apco Mossberg Reels, Spools and Bobbins are designed to give you the exact balance and trueness you need.

For more information, write, wire or call collect.

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CANADIAN REPRESENTATIVE:
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Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS

NEW..."Low Cost" PRUTTON PLANETARY THREAD ROLLING MACHINE for *Short Runs and Special Runs*

- FAST SET-UP TIME
- LOW DIE COST—USES NEW STYLE SMALL PLANETARY DIES

Now, for the first time in the history of thread rolling, short runs and special runs can also be produced economically on a planetary machine—the small, new Prutton, Model 75A-24.

This low cost machine uses small new style Prutton Planetary Dies—rolls class 3 fit. Fast set-up time—*change to different thread lengths in only 30 seconds.* No shims needed for easy die matching. Simple mechanical type uninterrupted feed. All working parts visible and easily accessible. Large 24" hopper holds 50 lbs.

SPECIFICATIONS

Capacity	**No. 4 screws to 1/4"**
Thread length	**up to 2"**
Overall blank length	**3"**
Production speed	**400 ppm**

An excellent extra machine for economical, dependable, fast production—keep your large Prutton machines busy on big production of long runs. Send us prints and/or samples of your part for exact machine cost.

PRUTTON PLANETARY THREAD ROLLERS

PRUTTON CORPORATION

Leader in Planetary Thread Rolling Machines

5305 WEST 130th STREET CLEVELAND 30, OHIO

so shows the strong side of the spring which can then be reground to provide a more uniform pressure.

* * *

A Dial Indicator, fully jewelled and shock resistant, is mounted on the left column and an adjusting screw provides a quick setting for small deflections.

* * *

Adjustable stops and tolerance markers for rapid production testing permit up to 600 tests per hour. The capacity is 1/2 oz. to 175 lbs., with spring lengths up to 10 in. and spring diameters up to 2-3/8 in. Such springs are extensively used in aircraft, missiles, switches, valves and electronic assemblies.

* * *

Bulletin describing the tester will be sent by **The Carlson Co.**, 3457 Weidner Ave., Oceanside, L.I., N.Y.

UL Approved Teflon "FEP" Insulated Wire Introduced by Philadelphia Insulated Wire

Philadelphia Insulated Wire Company, Moorestown, N.J., is now producing Teflon "FEP" insulated wires which have been UL approved. This top quality insulated wire is particularly good for use in back panelling in the manufacture of electronic data processing equipment and miniature circuiting, where strenuous demands are made on thin-walled insulated wires.

* * *

According to the Company's sales manager, **Robert Campbell**, the Teflon "FEP" wire has a rated performance at 200° Centigrade and its tremendous durability enables it to withstand virtually every known solvent. It is available in long lengths, in all standard colors with or without stripes, solid and stranded conductors, in gauges 20 thru 26. An optional thin-walled nylon jacket is available for use when extreme abrasion resistance is desired.

* * *

In producing the Teflon "FEP" insulated hook-wire multi-conductor cable, Philadelphia Insulated

Wire Company is taking another step forward in its 141 year history of progress and service to government and industry.

Consulting Firm Specializes In Technical Marketing

Strategic Marketing Counsellors, a specialized management consulting and business research firm, has been formed to serve technical industry. The new company, which concentrates on marketing and corporate growth problems, is located in Stamford, Connecticut, with executive offices at 700 Summer Street.

* * *

The company's organization includes consultants who have been engaged in executive and technical capacities in industry, government and professional practice. In addition to marketing specialists and electrical, mechanical and chemical engineers, the firm employs a number of experts in related business professions. Among the fields represented are economics, patent law, finance and contract administration.

* * *

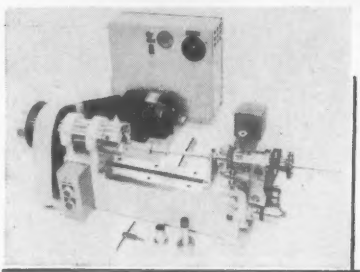
Much of the firm's work is oriented to the needs of industrial manufacturers and includes services in market research, marketing management, product planning, distribution and sales promotion. Other major activities involve counsel and assistance for new enterprise development, acquisitions and mergers.

* * *

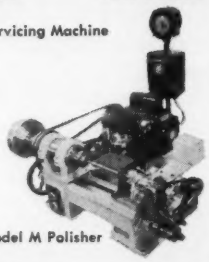
According to **Stanley L. Chaikind,** Managing Director, the company also provides product, market and economic evaluations for clients interested in diversification and expansion in industrial markets. He indicated further that research and advisory services are furnished to a variety of professional and trade groups.

To Sell —
Advertise in
WIRE AND WIRE PRODUCTS
It pays —
Send for rates
299 Main Street, Stamford, Conn.

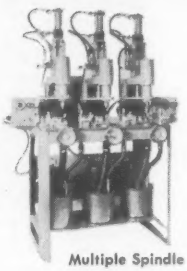
DYKREX *has it!*
a complete line of
AUTOMATIC DIE REFINISHING MACHINES
POLISHERS • DRILLERS • RIPPERS



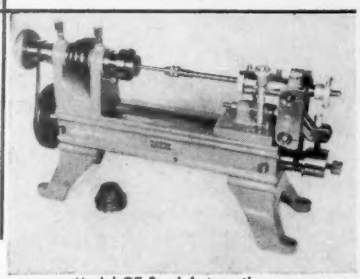
Die Servicing Machine



Model M Polisher



Multiple Spindle



Model OT Semi Automatic

you name it*-DYKREX *has it!

RIPPERS (2 TYPES) — The famous Model HD with revolving table. Multiple Spindle types light and heavy duty.

POLISHERS (3 TYPES) — Famous Model OT Semi Automatic. Model M Automatic Polishers and the new sensational DYKREX MX Die Servicing Machines.

DRILLERS — 10 Spindle Drillers and Pin Makers.

PIN GRINDERS — Model WE — so any die room operator can make their own precision lapping pins.

for Square or Shaped Dies

DS 3 Shaped Die Machine

DS 2 Sizing Machine

DS 1 Special Shaped Laps

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P. O. BOX 9022 NO. STATION, NEWARK 4, N. J.
FACTORY — 17-19 Grove St., Montclair, N. J. (Newark Suburb)

Outstanding Personalities of the Wire Industry

Beardslee Returns to Carbide Industry

K. R. Beardslee, who retired last spring from General Electric management, after serving as president of **Carboloy Co.,** and later general manager of the **Metallurgical Products Department,** is now associated with **Oscar M. Guensche,** owner of **Dawson Carbide Industries** of Detroit, and its affiliate, **Harrisville Tool Co.** of Harrisville, Mich.

* * *

Widely known in the metalworking industry, Mr. Beardslee is considered one of the pioneers of cemented carbide cutting tools. He became associated with the industry over 30 years ago, shortly after the man-made metal (then called Widia) was brought to the states from Germany.

* * *

Dawson Carbide Industries was established by Mr. Guensche 25 years ago, specializing in complete carbide tooling. With the introduction and acceptance of disposable carbide inserts, a production facility for this product was established in Harrisville, Mich., in 1953. This plant recently was enlarged and equipped with the latest production facilities for the expanding cutting tool market.

K. R. Beardslee

Textile Machine Works Appoints Chief Engineer

Walter Imboden, has been made Chief Engineer of **Textile Machine Works,** according to an announcement by **El Roy P. Master,** president of the company.

* * *

In this post, Mr. Imboden will have charge of Textile's Engineering Department and Development Laboratories.He is a graduate of Textile's Apprentice Training Program. He earned a scholarship to Pennsylvania State University in 1952, and graduated in 1955 with a Bachelor of Science degree in Mechanical Engineering. Since then he has been associated with the Engineering Department and was manager of the company's Development Laboratories prior to his being named Chief Engineer.

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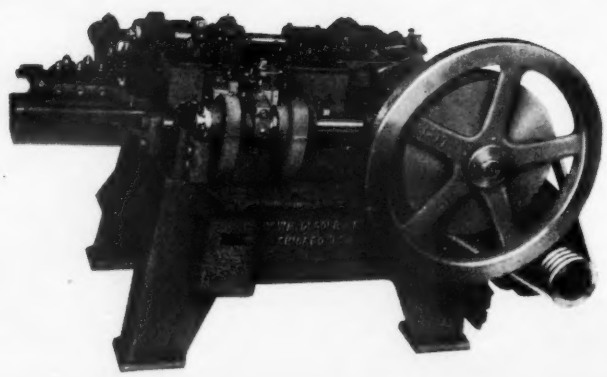
a NAME and MACHINE
that have stood for
DEPENDABILITY since 1887

our Nail Machine
"KNOW-HOW"
means $$$ for you



Wm. GLADER MACHINE WORKS
210 N. RACINE AVENUE
CHICAGO 7, ILLINOIS

EXPORT DEPT. 122 EAST 42ND STREET • NEW YORK 17, N. Y.

Promoted by Australian Wire Rope

R. Hanks has been appointed technical assistant to the manager of **The Australian Wire Rope Works Pty. Ltd.**

* * *

Holding diplomas in Metallurgy, Chemical Engineering, Industrial Chemistry and Mechanical Engineering, he began his career as a trainee at Rylands Bros. (Australia) Pty. Ltd., New-Castle plant, in 1937.

* * *

In 1957 he was transferred to the Rope Works as technical officer, where he was appointed general superintendent in 1959.

Appointed Vice President — Sales of Sheet & Tube

Robert E. Williams became vice president—sales of **The Youngstown Sheet and Tube Company** on October 1, 1961, succeeding **Myron H. Watkins** who resigned on that date after 36 years with the company.

Robert E. Williams

Mr. Williams, who previously was vice president—sales, of National Tube Division of United States Steel Corporation, was graduated from the University of California at Berkeley in 1935 with a bachelor of science degree in civil and structural engineering.

Appointed Plant Manager by Rea

Michael J. Pastrick, Jr. has been named plant manager of the Lafayette (Ind.) plant of **Rea Magnet Wire Company, Inc.,** subsidiary of Aluminum Company of America, it has been announced by **A. C. Sheldon,** Rea executive vice president.

* * *

He succeeds **Lytle Harlan,** manager of the Lafayette plant since it began operation in 1959. A twenty-five-year Rea veteran, Mr. Harlan will continue in an advisory capacity until his retirement.

* * *

Mr. Pastrick holds the chemical engineering degree from Carnegie Institute of Technology. For the last nine years he has served in management positions in the magnet wire industry, six of these as assistant manager of Rea's Fort Wayne (Ind.) plant.

Metz Retires

Albert F. Metz, executive consultant and former president of The Okonite Co., wire and cable manufacturing subsidiary of Kennecott Copper Corp., has retired. Mr. Metz began his Okonite career as an accountant in 1919. He was

Marking Machines, Wheels & Inks

FOR INSULATED WIRE, TUBING AND PIPE—

Type AM — Illustrated has these features:

1. Use present towers, no changes necessary.
2. One filling of ink well, gives 18 HOURS of continuous simulated spiral striping, number coding or printing.
3. For single or double marking or hash mark striping.
4. Constant wiper pressure.
5. Diam. range .032 thru 1½".

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West Hanover, Massachusetts, U. S. A.
CABLE ADDRESS: GEMGRA
Telephone: ROCKLAND TRiangle 8-0456

IN THE MARKING OF EXTRUDED MATERIAL THERE ARE BIG ADVANTAGES IN ONE SINGLE SOURCE OF SUPPLY.
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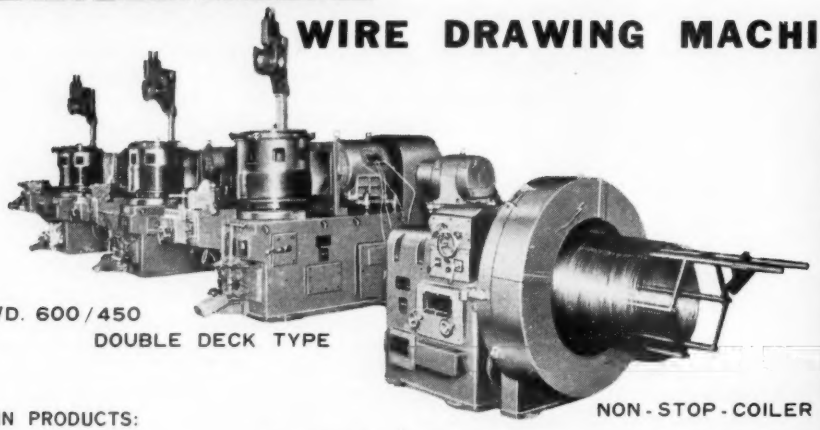
West Coast Representative: Paul I. Kenner Co., 230 Shaw Rd., So. San Francisco, Calif.
West Germany: Walter G. Fritzke GMBH, AM Wehrhahn 94-96, Dusseldorf, W. Germany
Warbrick Engineering Specialties Limited, Barclays Bank Chambers, Sanky Street, Warrington, England.

Tanisaka

Continuous
WIRE DRAWING MACHINE



CWD. 600/450
DOUBLE DECK TYPE

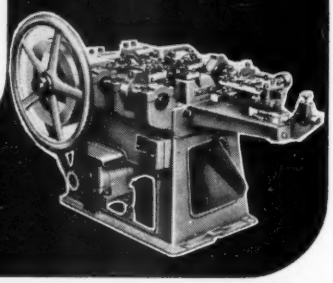
NON-STOP-COILER

MAIN PRODUCTS:

*Nail Making Machinery
*Barbed Wire Making Machine
*Wire Drawing Machinery
*Auxiliary Equipment and Accessories of Above Machines

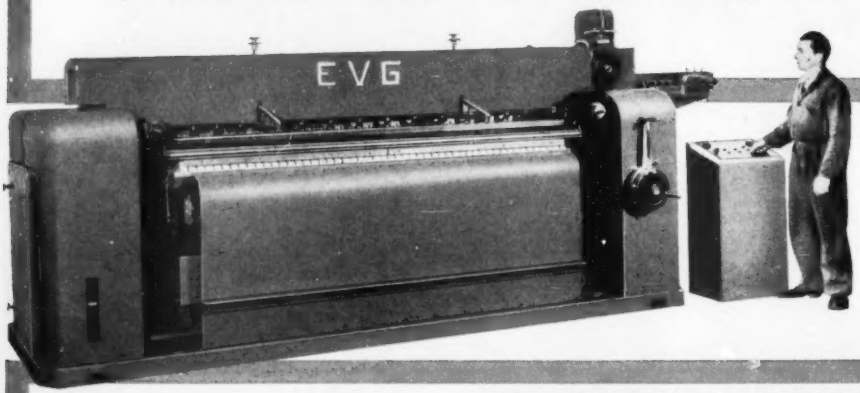
*Galvanized Sheet Flattener
*Sheet Corrugating Machine
*Galvanized Wire Take-up Machine

NAIL MAKING MACHINE



TANISAKA IRON WORKS LTD.
NO. 45, 1-CHOME, NAGASUNISHIDORI, AMAGASAKI, HYOGO, JAPAN
CABLE ADDRESS: "GOLDENTANISAKA" AMAGASAKI

COMPLETE LINE OF FULLY AUTOMATIC MESH WELDING EQUIPMENT



EVG designs and builds the world's most complete line of wire fabric welding machinery—five complete plants covering the entire field of welded mesh. Wire sizes from 7/0 to 25 gauge; all conventional spacings, down to 4 mesh (¼" x ¼").

Special plants can be engineered to customer's specifications.

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1. **Heavy Duty** model G 6 — designed to handle the heaviest meshes in use, i.e., pipe meshes.
2. **Standard Duty** — handles all constructions specified by engineers for reinforcing road fabrics.
3. **Medium Duty** — a specialized machine for the low-cost production of building mesh and similar fabrics.
4. **Light Wire** machine — a high precision welder, specifically designed for the production of visual type fabrics; fencing, mink batteries, etc.
5. **Fine Wire** machine — an extra high speed, flexible changeover welder. Particularly suited to the production of welded hardware cloth in all gauges and spacings.

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appointed comptroller in 1924, elected a director and treasurer in 1928, and vice president in 1945. He became president of the company in 1949, chairman of the board in 1953 and, in November, 1958, was named executive consultant when Okonite became a subsidiary of Kennecott Copper Corp.

New President Elected by Keystone

Daniel P. Sommer, 5128 Prospect Road, has been elected President of the **Keystone Steel & Wire Company** by the firm's Board of Directors. **Walter V. McAdoo, Paul W. Sommer** and **Walton B. Sommer** were re-elected vice presidents and members of the Executive Committee. **A. H. Sommer** was re-elected Vice President and General Superintendent.

* * *

Since 1945 **D. P. Sommer** has served as Keystone's Executive Vice President. As the new chief executive officer of the company,

Daniel P. Sommer

he succeeds **Reuben E. Sommer** who passed away October 9.

* * *

Son of **John Sommer,** a co-founder of the company, Mr. Sommer is a 48-year Keystone veteran. His service began as a draftsman, then continued through sales and treasury department assignments. He was Office Manager before becoming Assistant Treasurer in 1921. In 1926 he was appointed Secretary. He has been a member of the company's Board of Directors since 1928, when he was also elected Vice President and General Superintendent. Since 1935 he has been a member of the Executive Committee.

* * *

Mr. Sommer is a member of the American Iron & Steel Institute, and serves as a member of the board of directors of the National Lock Co., Rockford, Illinois, and Proctor Hospital of Peoria. He is Chairman of the Board of the Jefferson Trust and Savings Bank of Peoria.

Completes Course in Association Management

Mrs. Margaret J. McGinnis, Executive Manager of the **Industrial Diamond Association of America, Inc.,** has been awarded the Certificate of Graduation for the basic course at the Institute for Organization Management at

(*Please turn to page* 1723)

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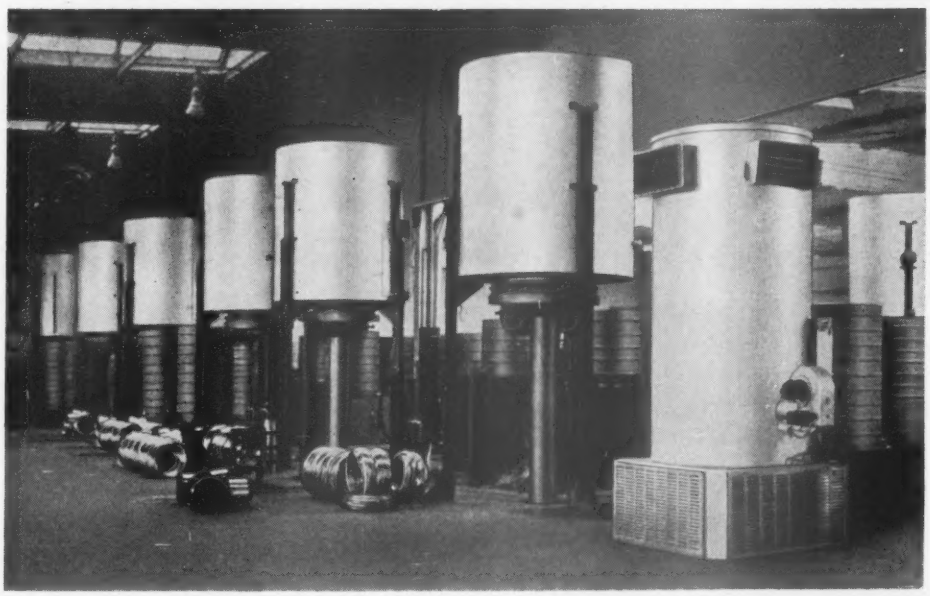

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Proper Lubrication and Its Relation to the Service Life of Wire Rope

(*Continued from page* 1696)

havior of the lubricant—a check whether cracking or flaking occurs; (3) ability of lubricant to stay on the wire rope during unreeling. This is especially critical on wire rope which has been treated with film-forming rust preventive that may interfere with the lubricant's adhesion, but it should be noted that some of the newer, polar-type corrosion inhibitors protect the steel and, at the same time, give the lubricant greater affinity for steel.

* * *

A further requirement on the lubricant is that it cling to the wire strands and to the dry fiber core even under the influence of the high pressures encountered in service. Frequently a corrosion inhibitor is incorporated into the lubricant.

* * *

Lubricant which is satisfactory from the point of view of performance is checked for ease of application by conventional methods.

* * *

To round out the information needed for choice of the best lubricant, field tests are required. Here, one must also determine whether an extreme-pressure additive will be a useful adjunct to the basic lubricant.

Types of Lubricant

Two types of lubricant are in general use: petroleum-base and asphalt-base. Many manufacturers strongly favor asphaltic oils because they set up firmly around the wire after hot (200-250°F.) application, and because they adhere to the rope in the face of considerable abrasion and washing.

* * *

Field lubricants are available in two forms: Heavy-bodied lubricants which must be heated or thinned before application, and light-bodied oils. If the rope is covered with dirt, a thin penetrating oil should be applied first before a heavier protective coating is applied. This lubricant must be able to penetrate easily into the voids available between strands as well as to the dry fiber core. For drip application, a light petroleum oil (app. 75-100 S.S.U. viscosity at 210°F.) is chosen. This material is light enough to penetrate into the strands but is not so thin that it will run down the external rope surface.

* * *

Heavy-bodied lubricants provide an excellent seal against moisture penetration and against attack by acid or caustic fumes. They are therefore used especially where these problems exist.

* * *

The drawback of applying heavy-bodied lubricants, applied without thinner, is that they congeal almost immediately upon contact with the rope's surface. Their function is thus essential only to form an external sheath which reduces loss of internal lubricant. This sheath may break in service or may have been carelessly applied so that a full seal is not obtained. Internal corrosion and deterioriation then occurs even though the rope appears, from external inspection, to be well lubricated.

* * *

For these reasons, and because they are more easily applied by

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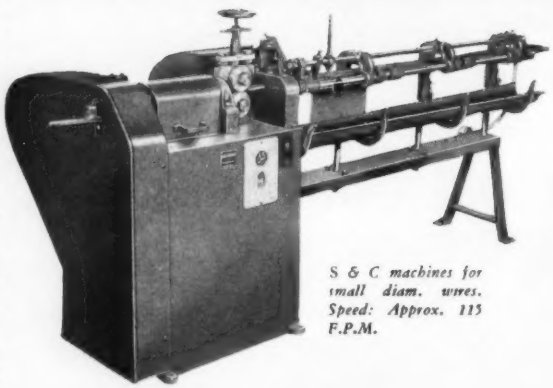

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continuous lubricating systems, there is currently a trend toward more extensive use of light lubricant oils.

* * *

The lubricant may be light-bodied itself, or mixed with a solvent or thinner. The latter approach permits the user to adjust the composition of the mix to maintain the same consistency as the temperature varies.

* * *

The thinner may be volatile or permanent. The former type is used for drip—or spray—application of heavy-bodied lubricants when it is desired to obtain a heavy coating of thick lubricant on the rope's surface. Permanent thinner is chosen if good penetration of the strands and core is the primary goal.

* * *

For rope in elevator service, a special situation exists. The lubricant must be tacky to prevent slip of the rope on the U-groove drums and it must be applied in a way which will eliminate any excess lubricant which might otherwise drop on the elevator system. For this service, some rope makers prefer a petroleum oil with soap and rosin and rust inhibitor additive.

Methods of Application

In service, lubricant may be applied by a stiff brush or a saturated rag, by passing the rope through a trough containing the lubricant, or by dripping or spraying lubricant on the rope.

* * *

Most of the lubricating systems for wire rope are home-made, and their design is adapted to the work service of the rope, to available space, and to the designer's ingenuity. The following general observation may, however, be made:

Hot application of heavy lubricants calls for use of special equipment which is relatively expensive to maintain and cumbersome to operate. Adequate methods of temperature control must be taken to ensure that the lubricant is not overheated to the point where its quality is degraded.

* * *

Thin-bodied lubricants may be applied by a **drip or spray method.** In a drip system, the lubricant is simply dropped onto the ropes. In spray application, the lubricant is atomized and sprayed by compressed air.

* * *

Drip or spray lubricant installations can be rendered automatic, continuous, or semi-continuous. Their functioning may be geared to the motion of the rope. Preferred location of the system is at the bend in the rope's travel where the strands are slightly opened so that penetration into the rope's interior is facilitated.

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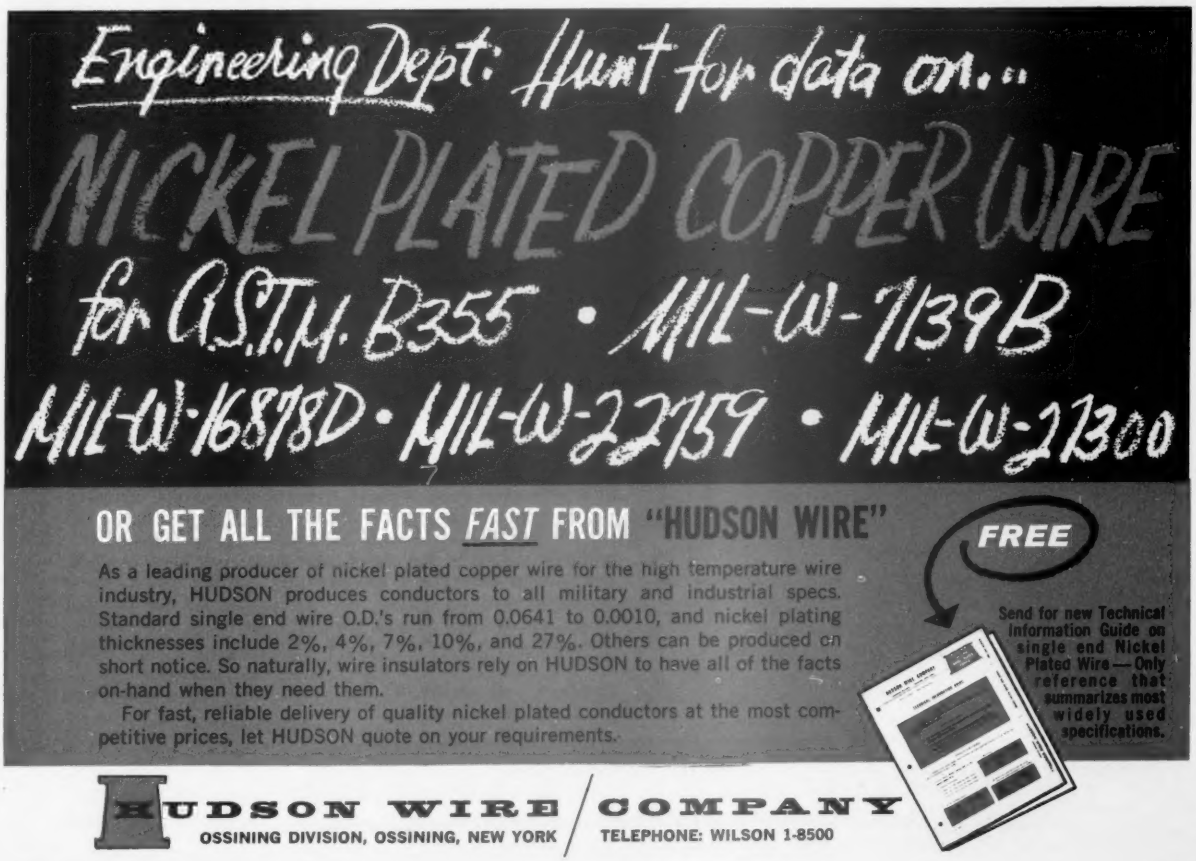
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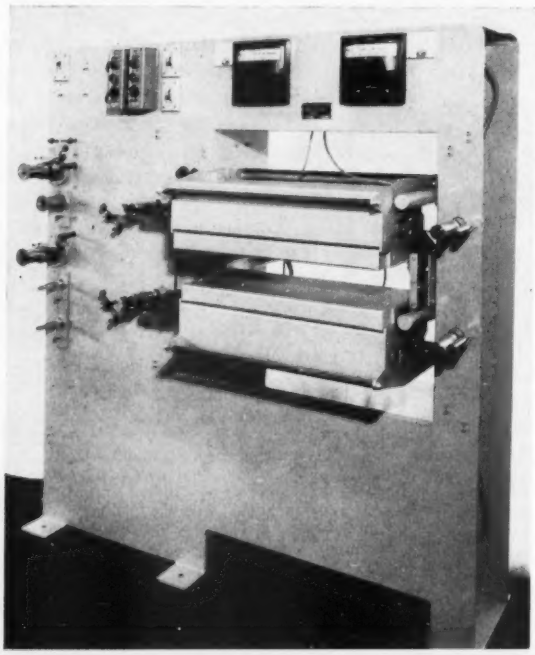

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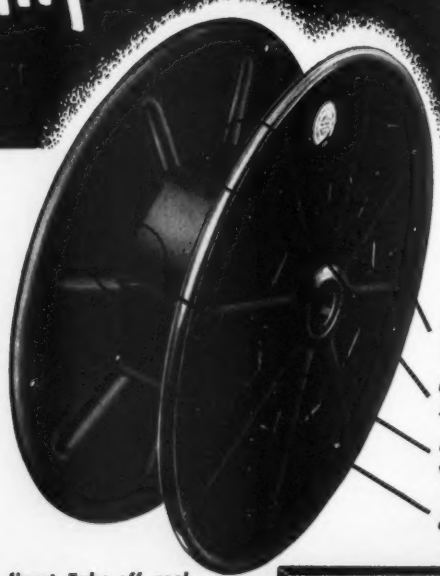

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109

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 3,002,408, WIRE STRIPPING APPARATUS, patented October 3, 1961 by Glendon H. Schwalm, Harrisburg, and Earl W. Wagner, Lebanon, Pa., assignors to AMP Incorporated, Harrisburg, Pa.

This apparatus is of a reciprocating carriage type with knives mounted on and movable with the carriage for cooperation with wire grippers. Six claims.

* * *

No. 3,002,445, WIRE TYING MACHINES, patented October 3, 1961 by Robert David Sansum, Hounslow, England, assignor to Gerrard Industries Limited, Brentford, England, and Rylands Brothers Limited, Warrington, England.

More specifically, the invention resides in a carriage supporting a workhead and mounted for sliding movement in the direction of wire movement, whereby when wire feed out means of the machine is reversed, the carriage and thus the workhead moves toward the article to be tied.

* * *

No. 3,002,865, METHOD OF STRENGTHENING THE SURFACE OF METALLIC SPRINGS BY WARM WORKING, patented October 3, 1961 by William R. Johnson, Bristol, Conn., assignor to Associated Spring Corporation, Bristol, Conn., a corporation of Delaware.

The method of surface strengthening a spring comprises forming the spring to shape, treating the spring as by heat treatment or cold working to impart thereto the principal part of the desired physical properties of the metal from which the spring is formed, heating the spring to a temperature above room temperature and just below the softening temperature of the metal of which the spring is formed, and while maintaining the spring at such temperature subjecting it to surface mechanical working which does not produce any substantial change in its shape or size.

* * *

No. 3,003,534, WIRE TRACTION INSERT FOR TIRES, patented October 10, 1961 by Edward Cousins, Akron, Ohio, assignor to The Goodyear Tire & Rubber Company, Akron, Ohio, a corporation of Ohio.

The insert has a number of teeth projecting normal to and terminating at the tread surface, each tooth being formed of a loop of wire twisted upon itself for the length of each tooth, these teeth being interconnected at the base of the insert by a base wire extending from the base of each tooth to the base of the adjacent teeth, whereby the teeth are maintained in interconnected relationship throughout the life thereof to prevent them from being thrown out of the tread.

* * *

No. 3,003,669, GARMENT HANGER, patented October 10, 1961 by Charles H. King, Oakland, and Marquerite V. West, Lafayette, Calif. (both of 166 Santa Clara Ave., Oakland 10, Calif.)

The main parts of the hanger are of wire, with a clamping rod hinged thereto. Five claims.

* * *

No. 3,005,579, ADJUSTABLE COAT HANGER, patented October 24, 1961 by James L. Thurber, 269 Perry St., Denver, Colo.

This wire hanger has, associated therewith, pads for the upwardly-extending wire arms of the hanger.

* * *

No. 3,005,600, BARBED WIRE DISPENSING AND REELING DEVICE, patented October 24, 1961 by Dayton O. Hyde, Yamsay Ranch, Box 81, Chiloquin, Oreg.

The device is adapted to prevent the wire to spin while being unwound and the device doubles as a reeler for taking up wire.

* * *

No. 3,005,601, METHOD AND MEANS FOR CONTINUOUSLY UNWINDING ELECTRIC AND THE LIKE WIRES WOUND OVER SPOOLS, patented October 24, 1961 by Marius Bernard Gazet, Lyon, France, assignor to Etablissements G. Decombe, Lyon, France, a company of France.

The method and apparatus contemplate the high speed unwinding of the wire in a chamber limiting the expansion of the bulging volume formed by the looping of the wire while thus unwound, the axes of the different spools to be unwound being directed in a manner such that they converge at a point located in the plane of the opening of

(*Please turn to page* 1734)

Standardize on ACROPAK* Spools!

Only ½ the Weight!

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Precision built
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ACROMETAL PRODUCTS INC.
616 5th Street North, Minneapolis 1, Minn.

The Story of Aluminum Insect Wire Screening

(*Continued from page* 1693)

warp beam. The bobbin speed insures accuracy in weaving 18 x 14 or 18 x 16 screening. Coordination between men and high speed machinery produces aluminum wire screening within the exacting government specifications.

* * *

When approximately 1,000 feet of woven mesh are run off, it is transported to the finishing room. Except for the fine wire, which some concerns prefer to purchase rather than to draw themselves, the process thus far has been standard for all weavers.

* * *

The next step may vary slightly with the company. Conveyor belts pass 1,000-foot rolls of aluminum screening through wash baths to remove foreign deposits which may have accumulated during the weaving. The clean mesh passes into a bath to be painted or coated to insure uniformity of appearance and, in some instances, to produce a color other than "natural aluminum." The screening is then vibrated to remove excess paint and moves on into a heated oven or tower for fast drying.

Close Inspection

When dry, every square foot of the screen is examined by inspectors trained to detect flaws to be cut out. Because of this occasional cutting, a few rolls of wire shipped to the customer may arrive in two sections.

* * *

At the other end of the inspection table, the screening is carefully measured into 100 foot rolls, boxed in individual cartons, labelled and sent to the stock room for shipment.

Continuing Research

Behind the precisely woven, high quality screening which reaches the customer lies extensive research in wire mesh. Through the efforts of the Insect Wire Screening Bureau and the aluminum industry, new possibilities for insect screening are constantly explored.

* * *

The Commodity Standard Division of the U. S. Department of Commerce recently issued a new industry specification which uses a wire diameter of 0.011 inch clad aluminum and a new 18 x 16 mesh. This product resulted from experimentation by most of the nation's weavers, and retains a good balance of air-light passage and insect protection.

* * *

This development is a result of the Insect Wire Screening Bureau's continuing research policy, which, through leading the way toward advances in aluminum wire screening, has made important contributions toward eliminating the spread of disease by flying insects.

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First in economy...

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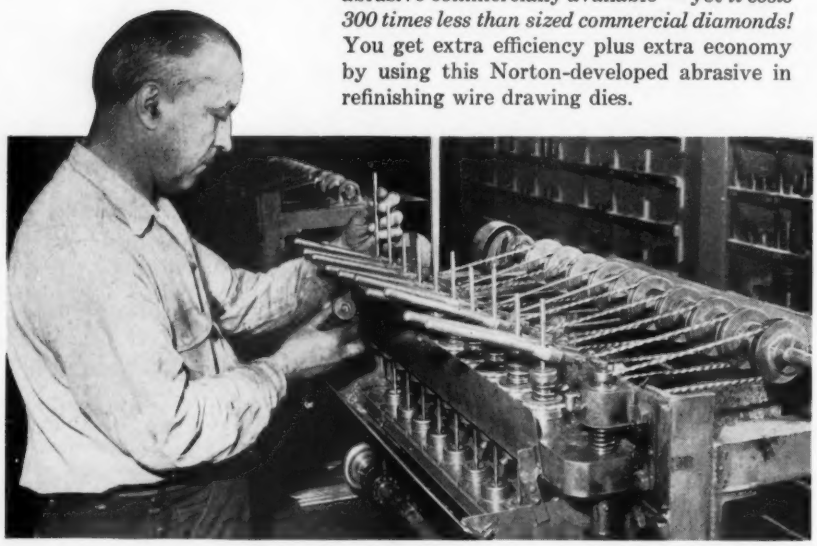
Next to diamonds and diamond dust NORBIDE grain is the hardest manufactured abrasive commercially available — yet *it costs 300 times less than sized commercial diamonds!* You get extra efficiency plus extra economy by using this Norton-developed abrasive in refinishing wire drawing dies.



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Report on An Advanced Contribution to Diamond Die Finishing

(*Continued from page* 1697)

through the diamond by those operatives known as the 'drillers'. It is without shape; only a small cone, and it is very, very rough. It is the 'finisher's' business to

bring the size up often as much as 20 mills or more, shape it the while, polish it, and round it up to the closest tolerance. It has to be shaped, smoothed, and polished. No scratches can be left in if possible. It is a highly precise operation.

* * *

Please take a simple mental step forward in logic. To do this cutting and shaping and polishing process accurately and well, the better a tension there is on the cutting instrument, and the more expertly the needle is bent, the more efficiently it will do its job.

* * *

Prior to the development of the new needle to be described there never has been one that would accomplish this task in the most efficient manner possible.

* * *

Such a needle now exists, though. It accomplishes its particular purpose admirably and remarkably well.

* * *

It also is a spring needle, except it is more expertly devised and executed into a needle that vibrates its point faster, more rhythmically in the spinning die and stirs and distributes the diamond dust evenly around all sides of the die-hole. Thus a faster and smoother cut is being made. While this is going on, it also has a shaping action. As the cams swing, the motion imparts a slight bend to the entire length of the needle that works its point in and out to an infinitesimal degree within the die-hole, thereby adding to the shape little by little all the time. This "special needle" cuts three times faster than any other needle the writer has seen. It does not make nor leave scratches. It is dependable; consistently good results always are obtained. Eases the nervous tension of doing the work, too.

* * *

The better the diamond die, the better it will serve its purpose in producing the highest quality of flawlessly smooth round wire that will be drawn through these better dies.

* * *

A set key-formula for the correct tensioning of this needle every time has been developed. It is neither difficult to learn nor to apply. It can be demonstrated at any time.

* * *

The die sizes to which particular reference is made in the usage of this new method range from .0126 to .0625 in finishing sizes and, naturally, every size between. With this new needle it is possible to take a freshly drilled die, only .006, cut it up fifteen mills in a matter of minutes using another little known method and then with the "special needle", swiftly shape it, polish it, and take it up to its finishing size another ten mills in a little more than two hours.

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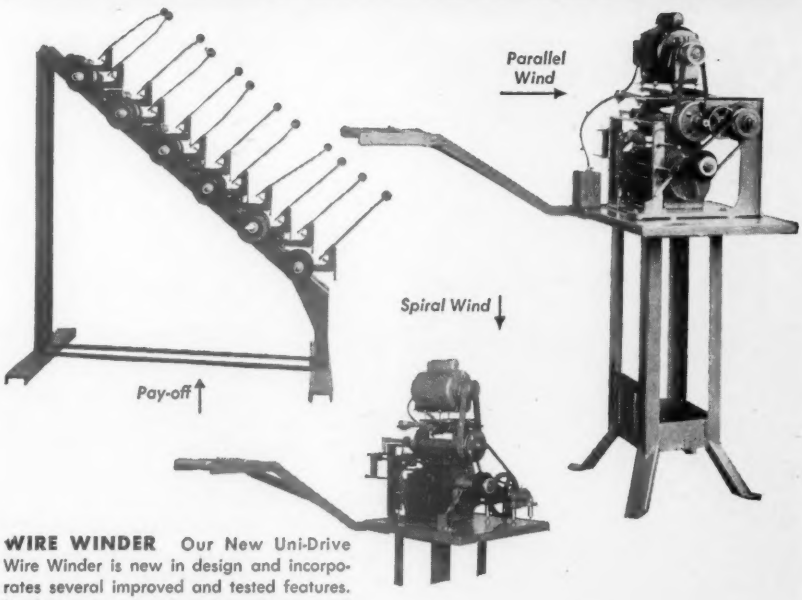
STANDARD UNI-DRIVE WIRE WINDER



WIRE WINDER Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAY-OFF Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

STANDARD MILL SUPPLY COMPANY
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

Charts, Graphs and Diagrams for Use in The Wire Industry

(*Continued from page* 1691)

they are 100% increases. This simple method saves a lot of calculations and the two examples show the value of the two types illustrating the same data. (Figs. 8 and 9).

* * *

Our two examples illustrate the total sales of wire and the sales of defective and scrap wire. The arithmetical chart (8) shows size of change; the logarithmic chart (9) shows rate of change; notice the difference shown on the rate of change graph. Two other points should be noted carefully in using rate of change graphs:—

(a) **Only vertical distances must be compared between two curves.**

(b) **Two (or more) items can be plotted on the same graph, as common units are not necessary when comparing rates of change, e.g. tons of wire, rolls of netting, cartons of nails.**

* * *

There are many applications of the logarithmic graph and with say three-deck co-ordinate paper when an extremely large range of figures can be plotted with ease.

Frequency Charts

This type has many applications, including all aspects of statistical quality control which is a subject entirely on its own. Certain other uses are, for example:—

(i) **Employees and earnings.**

(ii) **Outward traffic — loads and distances.**

(iii) **Number of orders against weight of orders.**

* * *

Such data as this when plotted gives a far better assessment than complete tables of figures and like all other charts dealt with previously, they are very easily read.

* * *

Closely allied to this type of graph are the many types of correlation charts which again are a completely separate entity and time and space are not available to go into detail. We can say at this point that work is in progress at the moment on correlation charts in statistical quality control with a marked degree of success. Suffice to say that in the wire firms correlation charts can be used to plot—

(i) **Cost per ton of various grades of wire.**

(ii) **Relations between size of plants and productions.**

(iii) **Relative earnings of similar occupations in various departments.**

and so on.

Pictorial Diagrams

This paper would not be complete without mentioning briefly the many types of pictorial charts and even models, that may be employed. We have seen them used with great success in the Press and more recently in such programmes as "Facts and Figures" on television. No doubt there is some application in the wire industry for such information to be put out for all to see but obviously this work requires a specialised "know-how" and an artistic background.

To Sum Up

(i) Convert all statistics and data into charts.
(ii) Keep strictly to definite standards.
(iii) Produce quickly, accurately and simply.
(iv) Circulate freely.
(v) Study and take action.

* * *

It is hoped that this paper has given a very brief idea of the type of work that can be undertaken to help in the understanding of the many various sections of a wire firm.

* * *

Experts are not needed for this job, someone is usually available on the spot who has a flair for this type of work and can make a start. Mistakes will be made, as in all new ventures. Wrong scales will be chosen, wrong combinations of data will be used and many things will be charted that are not essential or are of little use.

* * *

From all this, however, a certain amount of sense will emerge and all sections of the firm will become educated to read and interpret charts quickly.

* * *

Do not let the whole thing get out of hand by producing dozens of charts to be kept in bound folders and never referred to. It is far better to have simple charts which are of great value and are constantly referred to. Remember data may be charted for quite a long time before anything unusual is thrown up. Study carefully the rules of charting that have been formulated over the years as it will save a lot of time and trouble in the long run.

* * *

Perhaps you can use an information centre! Think about it.

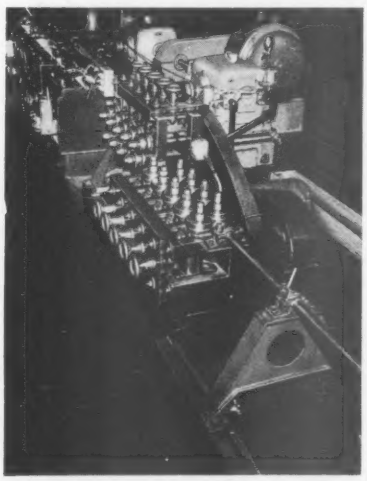
Author's Note: **All statistics and figures quoted in this paper are entirely hypothetical and are not taken from any actual data.**

Kenneth B. Cary

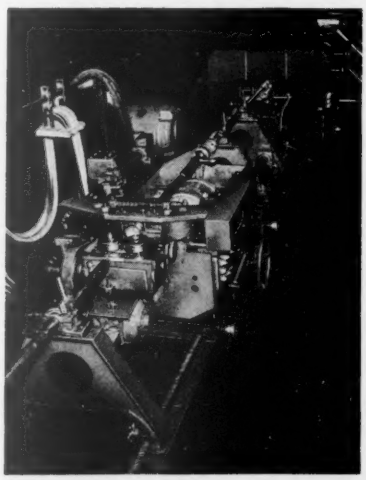
Kenneth B. Cary, Chairman of the Board and President of **Woodbridge Plastics, Inc.** and the **Tyson Corporation,** died on October 11th at his home in Montclair, New Jersey, at the age of fifty-four. Mr. Cary graduated from Rensselaer Polytechnic Institute in 1929 with a B.S. degree in chemical engineering. He joined **The Okonite Company** that year as a chemist and became chief rubber chemist four years later. From 1938 to 1945 he was manager of sales for the insulated wire and cable division of the **R. T. Vanderbilt Co.** Mr. Cary joined **Hamilton Laboratories, Inc.** in 1945 as vice-president, and in 1949 was appointed vice-president in charge of sales for the **Burgess Chemical Co.** This company was reorganized into **Cary Chemicals, Inc.,** with Mr. Cary becoming chairman of the board and president. In 1960 he purchased the **Tyson Corporation** and formed **Woodbridge Plastics, Inc.** Mr. Cary leaves his widow, two sons and a daughter.

LOMATIC

COMBINED DRAWING STRAIGHTENING CUTOFF AND POLISHING MACHINE



Payoff - Drawbench - Straightener



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The complete line comprises an uncoiler, a pre-straightener, a drawbench, a roller straightener, a flying cutoff, a polishing machine and a discharge table. All components required for the complete sequence of processing operations are interlocked mechanically and electrically into one integrated and synchronized line which is controlled by only one operator.

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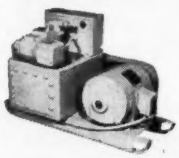

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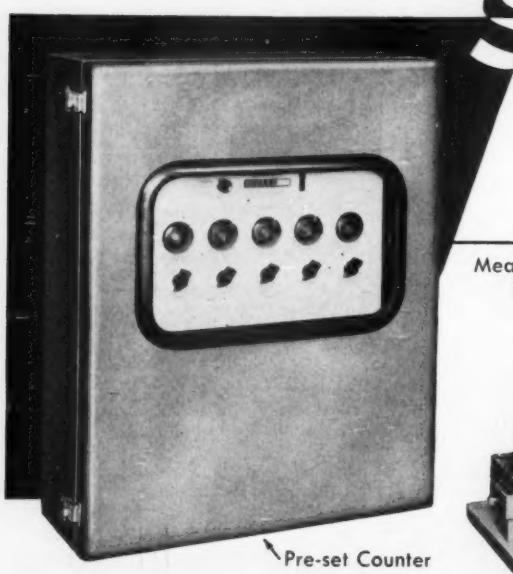

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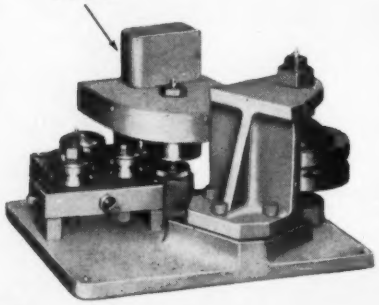
with CONTROL OF HELIX



Sjogren Single Roll Killers with a 3 roll casting device accurately controls cast to various diameter blocks. The helix is easily controlled by vertically raising or lowering the end roll on the 3 roll casting device. Designed for wire diameter of .062 to .187. Can be furnished with or without measuring wheel with photo-electric eye and pre-set counter.

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Ultrasonics in Motion

(*Continued from page* 1682)

Step #5 Drying to prevent contamination of atmosphere controlled furnace.

* * *

Tests have shown that the above speeds are possible with a reliability of lead removal which would preclude the necessity of a second cleaning after annealing. Here we wish to stress the word reliability. The ultrasonic cleaners will clean the same, hour after hour, around the clock. So far, we have eliminated handling during cleaning, automated the cleaning which means no wasted time in a soak tank, materially decreased the cleaning time, and eliminated the cleaning after annealing unless some staining occurs. Because of complete lead removal, the life of the annealing tubes is extended. Once again, the resultant product is superior to that obtained by the old method. Because ultrasonic energy enhances chemical reactions and because it also wets out all surfaces exposed, even the lead in the microscopic surface openings is removed. This allows the wire to be annealed without a change from its original analysis.

* * *

For those wires which are plated, the use of ultrasonic cleaning prior to the plating bath is a natural. Here again, the phenomenon of cleaning out microscopic surface openings allows a more intimate wetting by the copper flash. There is no drying or handling problem because the wire runs from the rinse bath after cleaning directly into the plating bath.

* * *

The examples cited are those with which the author and his associates have contact. Undoubtedly other processes are in practice in the industry. The future of ultrasonic energy in the wire and wire products industry is limited only by the imagination of those involved in its uses. Results which several years ago looked unattainable are now in hand. Problems which look so formidable today will be resolved as knowledge in the art is increased and better equipment becomes available.

* * *

The author and General Instrument Corporation wish to thank The Wire Association, its officers and members for the invitation extended to this paper. In particular, credits are due to Mr. David Schmid, Techalloy Co., Inc.; Mr. Robert Abbott, Bristol Brass; and Mr. Richard Brown, The Wire Association, for their aid.

Outstanding Personalities of the Wire Industry

(*Continued from page* 1713)

Syracuse University. The Institute is sponsored by the Chamber of Commerce of the United States. Mrs. McGinnis is a member of **The Wire Association.**

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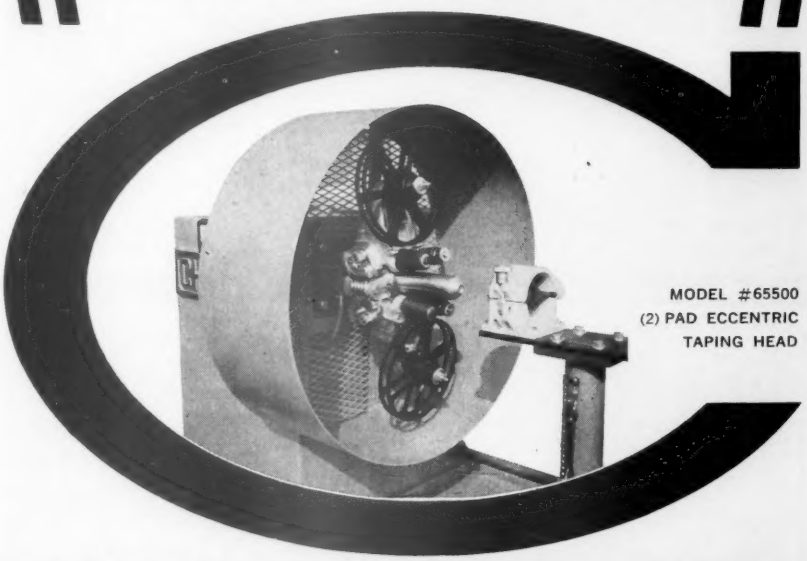

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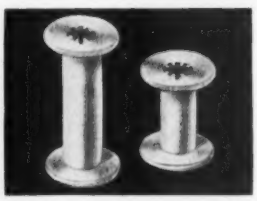

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STATEMENT required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) showing the ownership, management, and circulation of WIRE AND WIRE PRODUCTS, published monthly at Guilford, Conn., for year, 1961.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Richard E. Brown, 299 Main Street, Stamford, Conn.; Editor, Edmund D. Sickles, 299 Main Street, Stamford, Conn.; managing editor, none; business manager, Ruth S. Spengel, 299 Main Street, Stamford, Conn.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Quinn-Brown Publishing Corporation, 299 Main Street, Stamford, Conn.; Richard E. Brown, 299 Main Street, Stamford, Conn.; Leta B. Brown, 1424 Almeda Padre Serra, Santa Barbara, Cal.; Ruth S. Spengel, 299 Main Street, Stamford, Conn.

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4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960, to be included in all statements regardless of frequency of issue.) 4400 per month.

RUTH S. SPENGEL
Treas. & Business Manager

Sworn to and subscribed before me this 7th day of November, 1961.

BARBARA ANN FARYNIASZ
Notary Public
My commission expires April 1, 1965

Investigation of Variables in the Zinc Socketing of Wire Rope and Strand

(*Continued from page* 1679)

psi on bright wire and 6000 psi on galvanized wire. On full-sized socketing tests with wire rope, failure occurred in the main body of the rope without slippage of the socket. The solder used was priced at $1.60 a pound in bulk quantities. (Note: Zinc spelter is presently priced at about 15¢ a pound).

Proposed Socketing Procedure

From the preceding experiments a proposed zinc socketing procedure was developed. The major change from present standard practice as specified by the Wire Rope Technical Board is in wire preparation. The proposed procedure removes the safety hazards of using gasoline and acid. This procedure is intended for use with bright and galvanized wire rope and strand using zinc poured socket terminals capable of developing the full strength of the wire rope or strand.

A. Wire Rope or Strand Preparation

(1) Seizing — The wire rope or strand must be securely seized before cutting to prevent loss of lay when the rope is opened. Measure from the end of the wire a length equal to the length of the socket basket. Seize at this point.

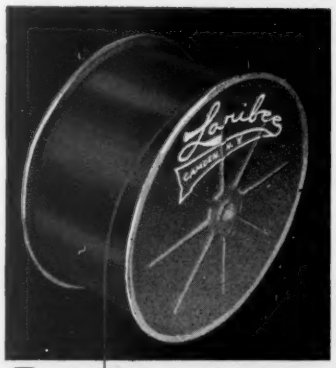
* * *

(2) Brooming — Maximum brooming is essential to good holding power. Cut out any fiber core the length of the socket basket. Broom out any steel core. Broom out the wires of each strand separately the entire length to be socketed.

* * *

(3) Cleaning—The wires should be cleaned the length to be socketed by the best available means, such as ultrasonic cleaner, a vapor degreaser and spray, or a good nonflammable solvent. In each instance the solvent is to be continually recirculated and filtered to remove contaminants. Shake the wires dry or blow off with clean compressed air. Be careful to keep the wires away from the floor or any other source of dirt, grease or

LARIBEE WIRE, Inc.



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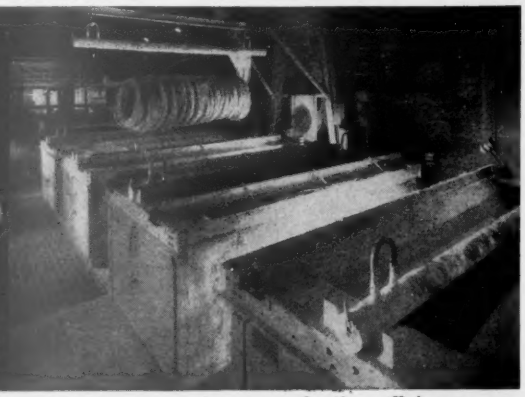

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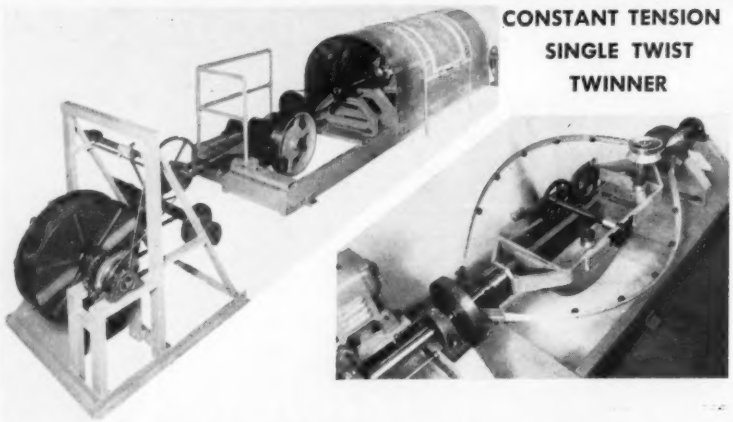

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other contaminants once they have been cleaned and proceed immediately to:

* * *

(4) Fluxing — Dip the wires in a clean, hot (160-200°F) solution of zinc ammonium chloride (ratio 1.5 lbs. to 1 gallon of water) for at least one minute and remove. Allow to air dry. As much as practical in further handling try not to disturb the fluxed surface of the wires and keep them clean.

B. Socket Preparation

(1) Preheating — The socket should be free of moisture or condensation. Warm slightly (especially in cold weather) — not above 200°F — to insure that there is no moisture present.

* * *

(2) Installing — Slip the socket over the ends of the wires. A gathering tool or temporary seizing may be necessary to insert the wires — handle the wires carefully to avoid disrupting the fluxed surface. Distribute all wires evenly in the basket flush with the top of the basket. Be sure socket is in line with axis of rope. The bottom should be sealed by using asbestos wicking.

C. Pouring Zinc

(1) Zinc — Use only "high grade" zinc per ASTM Specification B-6. Heat the zinc to a temperature of approximately 975°F, **using a ceramic or earthenware pot** to prevent contamination of the zinc. Skim off any dross which may have accumulated on the surface of the zinc bath.

* * *

(2) Pour — Pour the pure molten zinc into the socket basket in one continuous pour fast enough to prevent any freezing of the zinc before the pour is complete. Allow zinc to freeze completely before disturbing the socket.

D. Finishing

Remove all seizings. After cooling, apply lubricant to wires adjacent to socket to replace lubricant removed by heating of socketing. Socket is then ready for service.

Full Size Socketing Tests With Zinc

Full size socket tests at Williamsport verified the soundness of this practice. Based on holding power results of the single wire sockets using the above socketing procedures a CS-1 socket has been designed at Williamsport and tested. The full size socketing tests were made on 1″ diameter (6 x 25) independent wire rope core and fiber core bright rope and 1″ diameter (1 x 19) bridge strand. Each of these tests on rope and strand was first made using the full basket length of the socket and then in subsequent tests by varying the length of the rope end inserted in the socket basket. This height varied from a minimum 1″ up the full basket length of 5¾″ on the CS-1 socket and 9½″ on a standard strand socket.

* * *

Results of these full size socketing tests using the above procedure (which does not use gasoline or acid) are shown quite clearly in the picture (Figure 4). It shows the socket basket length actually needed to develop full breaking strength on the specimens tested. The CS-1 socket required a socket length of only 2½″ to develop the ultimate breaking strength of the 1″ diameter (1 x 19) bridge strand and only 1½″ in the socket for the 1″ diameter ropes. This contrasts to the 9½″ length of the standard strand socket.

* * *

Note how the length of the zinc slug from a standard 1″ diameter strand socket compares to the slug from a CS-1 socket and how each of these compares to the slug length actually required to hold the strand and wire rope. A slug from the single wire tests of the "B" socket is also shown.

Wire Kinks

(*Continued from page* 1701)

carbon content, and the amount of cold working will affect tensiles.

* * *

For example, a heavy reduction to produce a section of ⅜″ x .020″ with a tensile of 180,000 to 200,000 psi can be produced by rolling from

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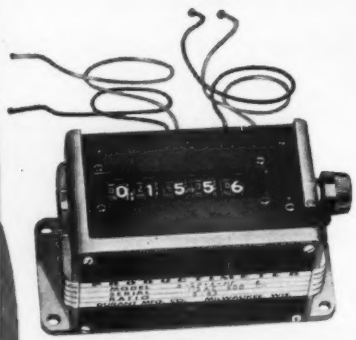

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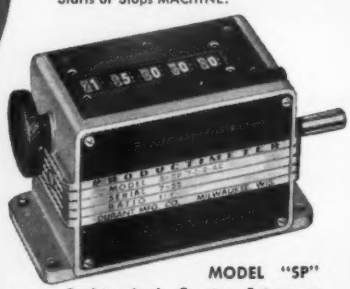

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a .252″ patented rod of appropriate carbon content. A ⅛″ x 1/32″ flat wire could start with an .070″ round wire of 210,000 psi. The flattening would increase the tensile to 230,000 psi.

* * *

In low carbon wire for forming, the second category, which can have tensiles of 40,000 to 100,000 psi, the flat rolling is not used to impart tensile strength, but mainly to produce ribbon wire of the size wanted. Annealing has to be done if maximum ductility is required for severe forming operations. For all flat wire of a ¼″ width or smaller, drawn wire must be used as stock. Very close tolerances can be secured in the rolling process.

* * *

A rule of thumb method for determining the size of the round wire required to produce a predetermined flat wire size is to add the width of the flat wire to its thickness and divide by two. For example, if a flat wire is wanted that is to be .280″ wide by .100″ thick, by adding these we get .380″, one half of which is .190″, the diameter of the starting round wire.

* * *

However, there are many factors that enter into this, such as roll diameter, material and thickness, chemical content of the wire, and wire hardness. Depending on these factors, it is customary to determine conditions and multiply the result by 1.0 to 1.2. An average 1.1 can be taken for preliminary calculations, which would indicate that the starting size of the round wire in this instance, should be .209 inches.

* * *

Wire, depending on final dimensions, may require a number of passes to complete the rolling. For example, a .258″ round steel wire can be given five passes through rolls to achieve a width of .375″ by .064″ in thickness. The selection of a correct wire flattening mill for a particular flat wire is necessary if high quality work and close tolerance are desired.

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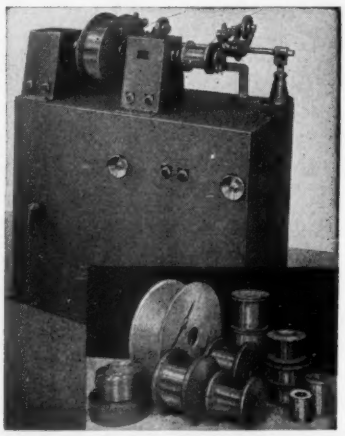

SPECIFICATIONS

Size Range: .010″ to .080″ or heavier if soft, and many flat wire sizes. Max. Spool Size: 16″ flange diam. Capacity: Usually 2 to 6 spindles.

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A New Approach to Die Shop Operations

(*Continued from page* 1674)

rough storage to be processed through the roughing station.

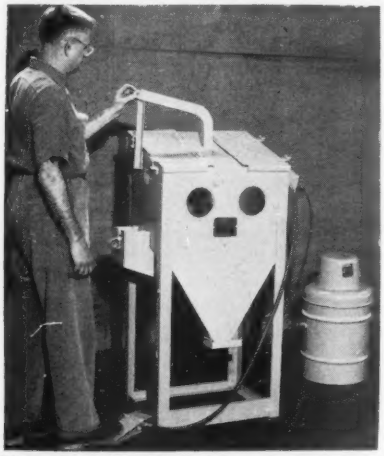

Figure 12 — Die Cleaner. * * * * *

This cleaning and inspection operation will usually take about an hour, leaving the die maker with three or four hours to help with the roughing operation.

* * *

A battery of four heavy duty roughers (see figure 13) is mount-

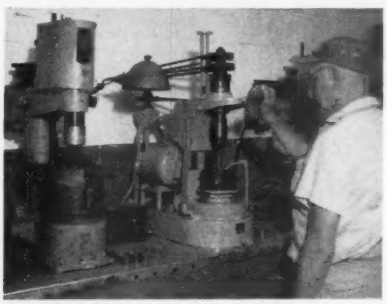

Figure 13 — Battery of Four Single-Head Heavy Duty Roughers. * * * * * *

ed in close proximity with the new roughing machines. The machines are charged with a mixture of 220 grit abrasive and kerosene. The dies are roughed to the meeting point diameter. After washing and inspecting, the dies are put in line for polishing on the polishing head. Each then receives the standard inspection and gaging given other dies processed on the new units.

* * *

The sizer operator also can operate the ten (10) spindle rougher (see figure 14) in case a greater demand is made for dies in the diameter range of 0.050 inch through

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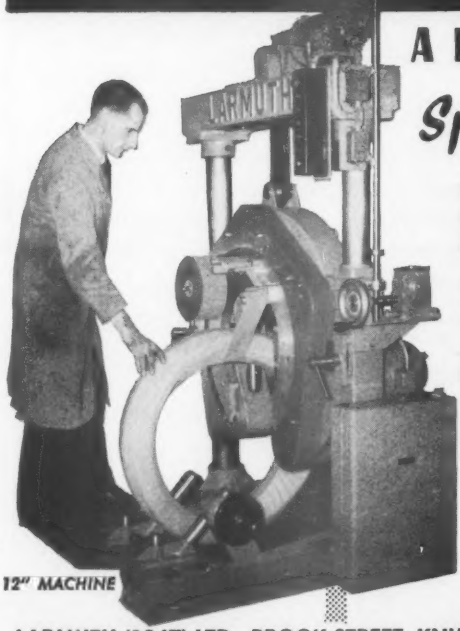

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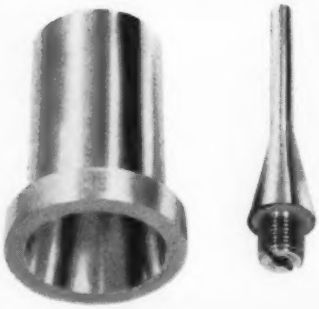

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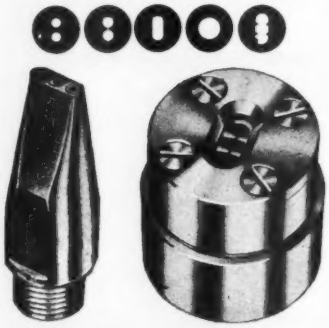

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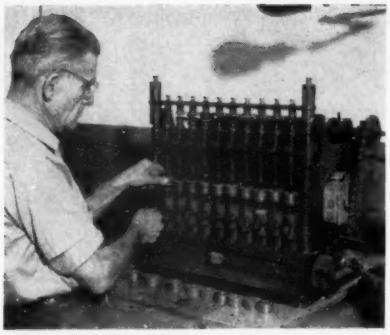

Figure 14 — Ten Spindle Rougher. * * *

approximately 0.110 inch. The establishment of a uniform job classification does permit a wide degree of latitude with which to operate the die shop. The die maker producing large diameter dies can shift to the battery of four roughers or the ten-spindle machine should a shortage develop during the day shift. During the evening shifts, the die sizer operator can move into the polisher station to make the larger diameter dies or any dies requiring special polishing. This degree of freedom works very nicely and also completely eliminates disputes over job responsibility.

* * *

Generally speaking, the transition from the former method to the present one has been made smoothly. Since the die requirements of the mill have not changed appreciably over the past year, it is safe to say that all demands for dies can be met and satisfied by the die shop. The savings can be directly apportioned to the savings of wages resulting from almost a fifty (50) per cent reduction of manpower.

* * *

The operation has not been running long enough to be able to generate a good firm set of figures for a production rate from these machines, but a short study has been made by the Industrial Engineering Department which was confirmed by the laboratory study.

* * *

The multi-head sizing machine should be able to size approximately forty (40) dies per hour with a reasonable mix spread between a diameter range of 0.050 inch through 0.225 inch. This also assumes the dies are sized from

the meeting point diameter using conditions outlined in this article.

* * *

It is somewhat more difficult to make up a set of production figures for the roughing units. Used dies are rarely alike and time cycles will vary. A set of figures was developed which comes closer to being proved each day. Three conditions must be fulfilled—proper use of abrasives as outlined above, proper operation of all heads, and roughing each die to the meeting point diameter. This chart shows the approximate time cycle for a series of die sizes but does not include polishing time.

Size (inches)	Time (minutes)	No. of Dies Rejected (per cent)
0.082	6	5
0.098	6	13
0.118	10	4
0.139*	20	20
0.165	15	24

* Approach angle increased 4° (included angle)

* * *

It is well to realize that the above times are for a broad scope of sizes. With this condition an operator approaches zero standby or idle time. A closer mix will actually cause interference between the heads causing some lost time. Proper training, familiarity with the equipment, and good planning will hold the lost time to a minimum.

* * *

We have had this new die shop arrangement at the Roebling Wire Mills now for several months. Admittedly it is not completely free from flaws, but these are being eliminated. Over-all, we consider the transition will be completely successful. Since we are permanently dedicated to a perpetual cost reduction program, our thinking must next be channeled to the introduction of a similar program in the fine wire die shop.

John C. Coppick

John C. Coppick died on June 28, 1961. He long had been a familiar figure at our Annual Conventions, except for the past few years.

* * *

Mr. Coppick was General Manager of the Ojibway plant of Ca-

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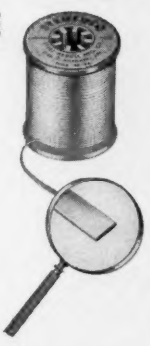

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nadian Steel Corporation Ltd. for many years, retiring in 1958 from active duty, but carrying on for the company as a consultant.

* * *

He had been a member of The Wire Association from the time of its organization in 1930.

An Analysis of Wire Insulating by the Fluidized Bed Process

(*Continued from page* 1676)

Polymer Degradation Processes", p 74, Butterworths Scientific Publications (London), 1956.
7. Kuczynski, G. C., J. Applied Physics, Vol. 20, p 1160 (1949).
8. Renfrew, A., Morgan, P., "Polythene", 2nd Edition, p 169, Iliffe and Sons, Ltd., (London) 1960.

John S. Morton

John S. Morton, Director of **Engis Equipment Company,** Chicago, died suddenly on October 12, 1961, after a minor operation. Mr. Morton was born and educated in Germany and had resided in the United States for more than thirty years.

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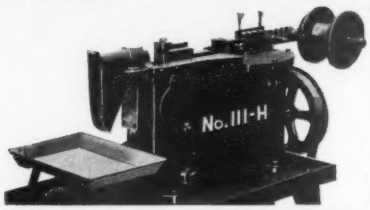

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* * *

Mr. Morton had been associated with Engis Equipment Company as Chief Chemist in charge of Research and Development and the production of Hyprez Diamond Compounds for twenty years.

* * *

His wife, **Caroline L. Morton,** has been and continues to be Treasurer of the Company.

A Review of Recent Wire Patents

(*Continued from page* 1717)

a passage for the wire that is being unwound.

* * *

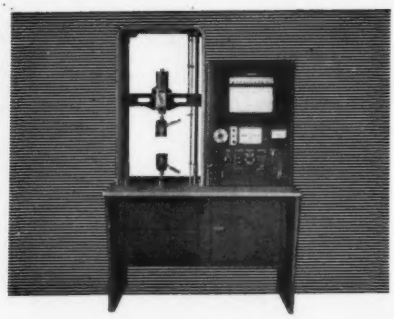
No. 3,006,787, METHOD OF IMPROVING PROPERTIES OF FLAME RESISTANT POLYETHYLENE AND PRODUCTS THEREOF, patented October 31, 1961 by Bernard A. Blewis, New York, N. Y., and Albert H. Steinberg, Newark, Ohio, assignors to General Cable Corporation, New York, N. Y., a corporation of New Jersey.

About the wire conductor is a polyethylene sheath, unimpaired as to resistance to crystallization and embrittlement as a result of aging, and the resistance to deformation under load at elevated temperatures, without impairment of the flame resistance, of polyethylene to which 18 to 47 parts by weight of antimony trioxide and 10 to 30 parts by weight of chlorinated paraffin containing 70% of combined chlorine to 100 parts by weight of polyethylene have been added, for the purpose of imparting flame resistance, 2 to 20 parts by weight of neoprene in the mixture.

* * *

No. 3,007,075, CATHODE, patented October 31, 1961 by Leonard D. Schwender, Emporium, Pa., assignor to Sylvania Electric Products, Inc., a corporation of Delaware.

For an electron tube cathode of the wrap-around coated type the inventor provides a cathode base sleeve about the cathode wire and an attached rhomboidal shaped coating sheet having opposite edges forming a spiral seam, the spiral seam being no longer than one turn around the cathode base sleeve.



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Major Breakthrough in Die Making Machinery

(*Continued from page* 1694)

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* * *

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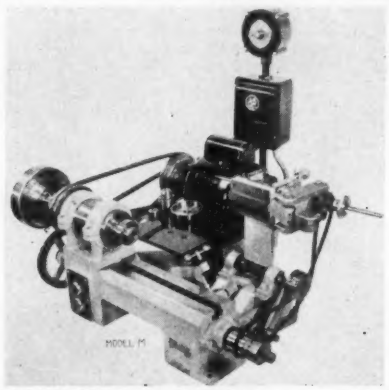

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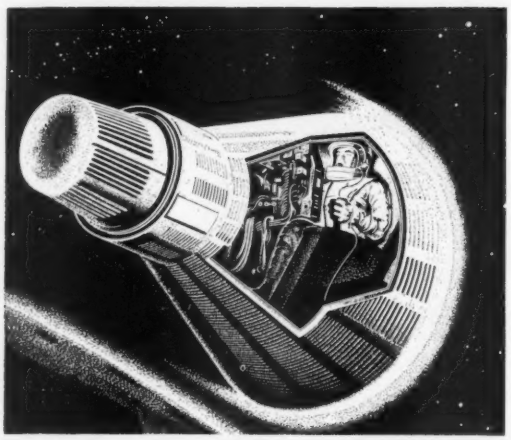

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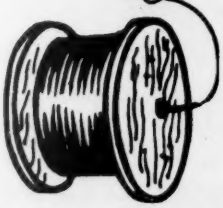

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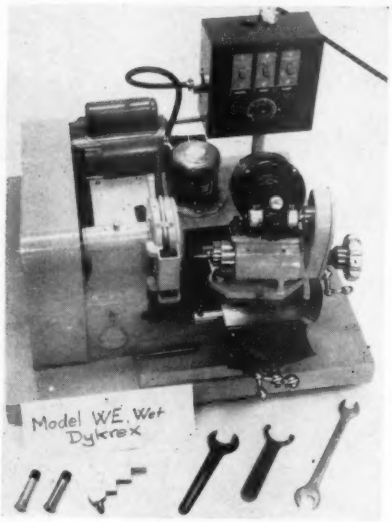

Model WE Wet Dykrex * * * * *

All that is necessary to do, is to set the die casing in the chuck, move the needle forward, apply the abrasive, set the timer for the work to be done, dial the speed desired, and push a button. The rest is automatic.

* * *

The oscillating tailstock holding the needle has a ½ inch diameter lapholder spindle to accommodate 1/32 to ½ inch shanks. The headstock runs on roller bearings, standard equipment for which is a 3-step collet and a jaw-chuck that can be adjusted in case of 'run-out'. Special 5", 6" and 7" chucks can be supplied, if needed.

* * *

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* * *

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1 Baling Press-American Baler Company
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1 Cabler-Vertical type
1 Steam Cleaner-Kerrick Model CGS, Just rebuilt, never used
1 Aluminum Melting Furnace-Stroman, gas-fired
1 Knitter-Fidelity Mach. Company, for NM type wire
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1 Laribee 7-Wire Drawing Machine for Fine Wire
1 Patch Stand-Hannifin
1 Taping Line, Syncro with five taping heads
2 Tapers-G. E. Concentric with drive
5 Twinners-New England Butt Co. & Edmands

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* * *

The die ripping or lapping machines referred to earlier, are heavy duty types made in two models, the #HD-3 and #HD-5 holding 3 inch and 5 inch diameter casings, respectively. The smaller machine is provided with a 1/3 HP and the larger one with a ½ HP motor. The equipment is provided with an abrasive pump, agitator, a reservoir base, ball-bearing spindle, spindle lift cam, turntable for time-saving, and other accessories to rough finish dies semi-automatically.

* * *

There are other types of tungsten carbide dies besides round dies, that are known as **shaped dies**, because they are square, hexagonal, and other various shapes. Again, Dykrex engineers developed automatic shaped die machines to refinish the bearing and angle of shaped dies.

* * *

To make the shaped die laps, Dykrex has a bench shaper with special index center to make special laps right in the die room.

* * *

In its long history of servicing the Wire Industry—long, considering the period of time that carbide dies have been in use—the Company has established a reputation for products that have kept pace with the technological developments in other phases of this progressive industry.

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For more complete information, consult the annual Wire and Wire Products Buyer's Guide. Advertisers who have contracted for 6 or more insertions are entitled to up to 8 listings in this section of Wire and Wire Products.

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Alabama Wire Die Co., Fayette, Ala.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

ABRASIVES— Shot & Grit, For Cleaning
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka. Ind.

ACID INHIBITORS
(See Inhibitors, Pickling)

ANNEALING MACHINES — Electric Resistance
American Laubscher Corporation, New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Walco Electric Co., Providence, R. I.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BAR—Steel
Eaton Mfg. Co., Massillon, Ohio

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

BORAX—Wire Drawing
U. S. Borax, New York, N. Y.

BRAZERS—Electric for Wire
Steele Company, M G., Rome, N. Y.

CABLE ACCESSORIES
Southwire Co., Carrollton, Ga.

CABLE—Electric
Laribee Wire Inc., Camden, N. Y.
Southwire Co., Carrollton, Ga.

CABLE FILLERS—Paper
Ludlow Corporation, Needham Heights, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

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Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Div. of Franklin Research and Development Corp., Mystic, Conn.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering (Radcliffe) Co., Ltd., Manchester, England

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Refractory
Amchem Products Inc., Ambler, Pa.

CLEANERS—Metal
Amchem Products Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Circle Chemical Co., Chicago, Ill.
Magnuson Products Corp., Brooklyn, N. Y.
Miller R. H., Co., Inc., Homer, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Frankfort, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.
Wheelabrator Corporation, Mishawaka, Ind.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH—Wire, All Metals—
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Amchem Products Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Chemical Products Corporation, E. Providence, R. I.
Magnuson Products Corp., Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
U. S. Borax, New York, N. Y.

COLOR CONCENTRATES—For Wire Coatings
Blane Corporation, The, Canton, Mass.

COMPOUNDS—Brazing
Steele Company, M. G., Rome, N. Y.

COMPOUNDS—Coppering
Amchem Products, Inc., Ambler, Pa.
Circle Chemical Co., Chicago, Ill
Miller, R. H., Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Alabama Wire Die Co., Fayette, Ala.
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

COMPOUNDS—Extrusion, for Wire
Amchem Products Inc., Ambler, Pa.
Blane Corporation, The, Canton, Mass.
Circle Chemical Co., Chicago, Ill.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

COMPOUNDS—For Improving Drawing & Extrusion
Amchem Products, Inc., Ambler, Pa.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Metal Finishing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Chemical Products Corporation, E. Providence, R. I.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Phosphate Coating
Amchem Products, Inc., Ambler, Pa.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Rust Preventing
Amchem Products, Inc., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Chemical Products Corporation, E. Providence, R. I.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Rust Removing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS—Vinyl
Blane Corporation, The, Canton, Mass.
Chemical Products Corporation, E. Providence, R. I.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Climax Molybdenum Co., Div., American Metal Climax, Inc., New York, N. Y.
Magnuson Products Corp., Brooklyn, N. Y.
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
U. S. Borax, New York, N. Y.

CONDUCTORS—Flexible, Electrical
Laribee Wire Inc., Camden, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

CONTROL PANELS—
Walco Electric Co., Providence, R. I.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

CUTTING TOOLS—Wire
Manco Mfg. Co., Bradley, Ill.
Porter, H. K., Inc., Somerville, Mass.
Robinson, M. W. Co., Rockville, Conn.

DIAMONDS—Industrial
Alabama Wire Die Co., Fayette, Ala.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Indiana Wire Die Co., Ft. Wayne, Ind.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIAMOND POWDERS—
Danforth Company, C.W., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Fort Wayne Diamond Products, Inc., Fort Wayne, Indiana
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

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Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIAMOND TOOLS—
Wayne Wire Die Co., Linden, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

DIES—Diamond
Alabama Wire Die Co., Fayette, Ala.
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J. Inc., New York, N. Y.
Brenon, Inc., Edison, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES DIAMOND—Controlled Drawing Angle
Hoosier Wire Die, Inc., Ft. Wayne, Ind.

DIES DIAMOND—Reversible
National Wire Die Co., Inc., New York, N. Y.

DIES—Extrusion
Alabama Wire Die Co., Fayette, Ala.
Central Tool and Machine Co., Bridgeport, Conn.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

Rusch Wire Die Corp., Croton-on-Hudson, N.Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Fenn Manufacturing Co., Newington, Conn.
Sjogren Tool & Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Edison, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Fenn Manufacturing Co., Newington, Conn.
Sjogren Tool & Mach. Co., Inc., Auburn, Mass.

DIES—Tinning
Roux Wire Die Works, Inc., Oriskany, N. Y.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Variable Speed
Allis Co., Louis, Milwaukee, Wisc.
Walco Electric Co., Providence, R. I.

DRUMS—Wire Packaging
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio

DUST COLLECTORS—Wet or Dry
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

ENGINEERS—Consulting
Bawden, William D., Wilton, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
Amchem Products, Inc., Ambler, Pa.
Chemical Products Corporation, E. Providence, R. I.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Annealing, Vacuum
Braun-Angott, Hagen, West Germany

FURNACES—Galvanizing Equipment
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Braun-Angott, Hagen, West Germany
Carl Mayer Corp., The, Cleveland, Ohio
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson Lee Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Braun-Angott, Hagen, West Germany
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

FURNACES—Strand Annealing
Braun-Angott, Hagen, West Germany
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GUIDES—For Wire
Alabama Wire Die Co., Fayette, Ala.
Heany Industrial Ceramic Corp., New Haven, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool & Machine Co., Auburn, Mass.

HOISTS—Electric
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Walco Electric Co., Providence, R. I.

INHIBITORS—Pickling
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Chemical Products Corporation, E. Providence, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS—
Blane Corporation, The, Canton, Mass.
Dow Corning Corporation, Midland, Mich.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

LACQUERNG SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Climax Molybdenum Co., Div., American Metal Climax, Inc., New York, N. Y.
Swift & Co., Chicago, Ill.

MACHINE CONTROLS—Electronic
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Armoring (Cable, Wire, Hose)
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

MACHINERY—Assembling
Pan American Supply Co., Long Island City, N. Y.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Tanisaka Iron Works Ltd., Amagaski, Hyogo, Japan

MACHINERY—Blast Cleaning
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

MACHINERY—Bolt, Rivet, Screw, etc.
National Machinery Co., Tiffin, Ohio
Prutton Corporation, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Fall, R. I.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Brazers for Wire
Steele Company, M. G., Rome, N. Y.

MACHINERY—Bunching
Cook Mfg. Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division of Wanskuck Co., Providence R. I.
Niehaus K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Cable, Electric
Chesney Tool and Engineering Corp., Glendale, California
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corp., New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Pan American Supply Co., Long Island City, N. Y.
Wafios Machinery Corp., Hackensack, N. J

MACHINERY—Chain Making
Pan American Supply Co., Long Island City, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Coulter & MacKenzie Machine Co., Bridgeport, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Cold Forging
National Machinery Co., Tiffin, Ohio

MACHINERY—Cold Heading
National Machinery Co., Tiffin, Ohio
REM Sales Incorporated, Subsidiary of The Robert E. Morris Co., West Hartford, Conn.
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Copper Wire Drawing
Cook Mfg. Co., The, Paterson, N. J.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., New York, N.Y.
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch., (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Manufacturing Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Cutters, Hydraulic for Rod & Bar
Manco Mfg. Co., Bradley, Ill.
Porter, H. K., Inc., Somerville, Mass.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Corporation, Alhambra, California
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Descaling Rod, Dry
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fisher Associates, New York, N. Y.
Herborn Machinery Corporation, Hackensack, N. J.
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Diameter Control
Muirhead Instruments Inc. (Addison Electric Co., Ltd.) New York, N. Y.

MACHINERY—Die Making
Alabama Wire Die Co., Fayette, Ala.
Boulin, Victor J., Inc., New York N. Y.
Dykrex Corp. of America, Newark, N. J.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Sjogren Tool & Machine Co., Auburn, Mass.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corp., New York, N. Y.

Loma Machine Manufacturing Co., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Torrington Manufacturing Co., Torrington, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Eccentricity Control
Muirhead Instruments Inc. (Addison Electric Co., Ltd.) New York, N. Y.

MACHINERY—Edging (See MACHINERY—Tandem Rolling and Edging Mills)

MACHINERY—Enameling
Acrometal Products, Inc., Minneapolis, Minn.
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
General Engineering (Radcliffe) Co., Ltd., Manchester, England
Johnson Machinery Co., Elizabeth, N. J.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester England
Wafios Machinery Corp., Hackensack, N. J

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack N. J.
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio
Torrington Manufacturing Co., Torrington, Conn.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Forming Wire
National Mach'y Exch., (Used), New York, N. Y.
Pan American Supply Co., Long Island City, N. Y.
Straus-Artys Corp., Great Neck, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Galvanizing Wire
Miyazaki Iron Works, Ltd., Osaka, Japan
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.

MACHINERY—Impregnation Control Paper Cables
Muirhead Instruments Inc. (Addison Electric Co., Ltd.) New York, N. Y.

MACHINERY—Insulating Wire
American Insulating Mach'y. Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
Cook Mfg. Co., The, Paterson, N. J.

MACHINERY—Lock Washer
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
General Engineering (Radcliffe) Co., Ltd., Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

MACHINERY—Measuring and Control—Coating
Davis-Standard Div. of Franklin Research and Development Corp., Mystic, Conn.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Co., Tiffin, Ohio
National Mach'y Exch. (Used), N.Y., N.Y.
Pan American Supply Co., Long Island City, N. Y.
Tanisaka Iron Works Ltd., Amagaski, Hyogo, Japan
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California

MACHINERY—Pin
REM Sales Incorporated, Subsidiary of The Robert E. Morris Company, West Hartford, Conn.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch., (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Preheaters, Wire
Federal Manufacturing Company, Wallingford, Conn.
Muirhead Instruments, Inc. (Addison Electric Co., Ltd.) New York, N. Y.
Walco Electric Co., Providence, R. I.

MACHINERY—Printing on Electric Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Acrometal Products, Inc., Minneapolis, Minn.
Bartell Machine Tool Corp., Rome, N. Y.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Miyazaki Iron Works, Ltd., Osaka, Japan
National Mach'y Exch. (Used), New York, N. Y.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Rod Mill
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Loma Machine Manufacturing Co., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Spark Testing
Muirhead Instruments Inc. (Addison Electric Co., Ltd.) New York, N. Y.

MACHINERY—Special
American Machinery Co., Inc., Mentor, Ohio
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Spring Making
National Mach'y Exch., (Used), New York, N. Y.
Pan American Supply Co., Long Island City, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Straightening & Cutting
American Laubscher Corp., New York, N. Y.
Johnson Machinery Co., Elizabeth, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Pan American Supply Co., Long Island City, N. Y.
Patterson Machine Co., The Geo. C., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp. Rome, N. Y.
Haskell-Dawes Machine Co., Phila., Pa.
Johnson Machinery Co., Elizabeth, N. J.
Krupp, Fried, Maschinen-und Stahlbau, Rheinhausen, Germany
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Tandem Rolling & Edging Mills
Fenn Manufacturing Co., Newington, Conn.
Loma Machine Manufacturing Co., New York, N. Y.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.

MACHINERY—Take-Up and Pay-Out
Acrometal Products, Inc., Minneapolis, Minn.
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
General Engineering (Radcliffe) Co., Ltd., Manchester, England
Johnson Machinery Co., Elizabeth, N. J.
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Tanisaka Iron Works Ltd., Amagaski, Hyogo, Japan
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Chesney Tool and Engineering Corp., Glendale, California
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Thread Rolling
Mettler Machine Tool, Inc., New Haven, Conn.
Prutton Corporation, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Tinning Wire
American Insuating Mach'y Co., Phila., Pa
Cook Mfg. Co., The, Paterson, N. J.

Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Manufacturing Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N.J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
Johnson Machinery Co., Elizabeth, N. J.
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Variable Speed Drives
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Welded Wire Mesh
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Schlatter, Ltd., H.A., Zollikon, Zurich

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Davis Electric Co., Wallingford, Conn.
Davis-Standard Div. of Franklin Research and Development Corp., Mystic, Conn.
Emory Company, Robert J., Newark, N. J.
Federal Manufacturing Company, Wallingford, Conn.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York, N. Y.
Cook Manufacturing Co., The, Paterson, N.J.
Coulter & McKenzie Machine Co., Bridgeport, Conn
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., New York, N. Y.
Miyazaki Iron Works, Ltd., Osaka, Japan
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Pan American Supply Co., Long Island City, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Societa Generale Delle Macchine Mill, Milan, Italy
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Straus-Artys Corp., Great Neck, N. Y.
Superior Tool & Machinery Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Tanisaka Iron Works Ltd., Amagaski, Hyogo, Japan
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Wartenweiler, Emilio, Milano, Italy—SAMP
Watkins & Sons, Inc. R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California
Wire Machinery Inc., Chicago, Ill.

MACHINERY—Wire Rope
Chesney Tool and Engineering Corp., Glendale, California
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp, New York, N. Y.
Larmuth (1947) Ltd., Cheshire, England

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

MOLYBDENUM-DISULFIDE—Lubricants
Climax Molybdenum Company, a division of American Metal Climax, Inc., New York, N. Y.

MOTORS—Electric
Allis Co., Louis, Milwaukee, Wisc.
Walco Electric Co., Providence, R. I.

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Mach. Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Co., Winsted, Conn.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAPER—Coil Wrapping
Ludlow Corporation, Needham Heights, Mass.

PAPER—Insulating
Ludlow Corporation, Needham Heights, Mass.
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Chemical Products Corporation, E. Providence, R. I.
Dow Corning Corporation, Midland, Mich.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.

PREHEATERS—Wire
(See MACHINERY—Preheaters, Wire)

PRINTING WHEELS—for Electric Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—for Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool & Mach. Co., Auburn, Mass.

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Acrometal Products, Inc., Minneapolis, Minn.
Mettler Machine Tool, Inc., New Haven, Conn.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Merrimac Spool & Reel Co., Inc., Haverhill, Mass.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio

REELS & SPOOLS—Custom Made
Merrimac Spool & Reel Co., Inc., Haverhill, Mass.

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS—Plywood
Antrim Reel, Inc., Haverhill, Mass.
Carris Reels, Inc., Rutland, Vermont
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Carlton Manufacturing Co., Pawtucket, R. I.
Clark Manufacturing Co., J. L., Rockford, Illinois
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Merrimac Spool & Reel Co., Inc., Haverhill, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vermont
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Nelson Co., The, Baltimore, Md.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
Antrim Reel, Inc., Haverhill, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vermont
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Nelson Co., The, Baltimore, Md.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
Western Wire Corporation, Boston, Mass.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Eaton Mfg. Co., Massillon, Ohio
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Hutte, A. G., Duisburg, Germany
Northwestern Steel & Wire Co., Sterling, Illinois
Sumitomo Metal Industries, Ltd., Osaka, Japan
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Yawata Iron & Steel Co., Ltd., Tokyo, Japan

ROPE—Wire
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons, Div., Colorado Fuel & Iron Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Removing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SCRAP WIRE—Bare or Insulated, Bought
Electro Metals Separation Co. Div. of M. J. Stavola & Co., Inc., Danbury, Conn.

SILICONE RUBBER—For Wire Insulation
Dow Corning Corporation, Midland, Mich.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—For Retail Sale of Wire
Antrim Reel, Inc., Haverhill, Mass.
Carlton Manufacturing Co., Pawtucket, R. I.
Clark Manufacturing Co., J. L., Rockford, Illinois

SPOOLS—Paper
Merrimac Spool & Reel Co., Inc., Haverhill, Mass.

SPOOLS—Plastic
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Merrimac Spool & Reel Co., Inc., Haverhill, Mass.
Plastic Mold & Eng. Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS—
Jarke Manufacturing Co., Chicago, Illinois

STRAND—Galvanized Steel
Southwire Co., Carrollton, Ga.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.

Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)

TENSION METERS—for Wire
Boulin Instrument Corp., Pelham, N. Y.
Tensitron, Inc., Harvard, Mass.

TESTERS—INSULATION
(See Testing Equipment—for Dielectric Faults)

TESTING EQUIPMENT—Dielectric Faults in Insulation
Davis Electric Co., Wallingford, Conn.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Muirhead Instruments Inc. (Addison Electric Co., Ltd.) New York, N. Y.

TESTING EQUIPMENT—Physical
Scott Testers, Inc., Providence, R. I.
Steele Company, M. G., Rome, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL-Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable Speed (See Adjustable Speed Drives)

TRAVERSE & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

VARNISHES & LACQUERS—for Electric Wire
Chemical Products Corporation, E. Providence, R. I.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Herborn Machinery Corporation, Hackensack, N. J.
Micro Products Co., Chicago, Ill.
Schlatter, Ltd., H.A., Zollikon, Zurich

WHEELS—for Printing on Electric Wire
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—ACSR
Southwire Co., Carrollton, Ga.

WIRE—Aluminum
Malin & Co., The, Cleveland, Ohio
Southwire Co., Carrollton, Ga.

WIRE—Ball & Roller Bearing
Eaton Mfg. Co., Massillon, Ohio

WIRE-Braiding, Flat
Steel Heddle Mfg. Co., Philadelphia, Pa.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio

WIRE—Brush
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.

WIRE—Building, Electric
Southwire Co., Carrollton, Ga.

WIRE—Bunched and Stranded
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Buchanan, N. Y.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Western Wire Corporation, Boston, Mass.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Copper
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.
Malin & Co., The, Cleveland, Ohio
Southwire Co., Carrollton, Ga.
Steel Heddle Mfg. Co., Philadelphia, Pa.

WIRE—Coppered Stainless Steel
Western Wire Corporation, Boston, Mass.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Flat
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Montgomery Co., The, Windsor Locks, Conn.
Steel Heddle Mfg. Co., Philadelphia, Pa.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Detroit Steel Corporation, Detroit, Mich.
Northwestern Steel & Wire Co., Sterling, Illinois
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Detroit Steel Corporation, Detroit, Mich.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.

WIRE—Insulated
Southwire Co., Carrollton, Ga.

WIRE—Manufacturers
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Northwestern Steel & Wire Co., Sterling, Illinois
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Berger Div., Canton, Ohio
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Rylands Brothers Limited, Warrington, England
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Metalizing
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Buchanan, N. Y.

WIRE—Music
Malin & Co., The, Cleveland, Ohio
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Nickel Plated
Steel Heddle Mfg. Co., Philadelphia, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Detroit Steel Corporation, Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—for Prestressed Concrete
Rylands Brothers, Limited, Warrington, England
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Pin
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.

WIRE—Special Shapes
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Eaton Mfg. Co., Massillon, Ohio
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Stainless Steel
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Malin & Co., The, Cleveland, Ohio
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Nippon Stainless Steel Wire Mfg. Co., Ltd., Osaka, Japan.
Pittsburgh Steel Co., Pittsburgh, Pa.
Suzuki Metal Industry Co., Ltd., Tokyo, Japan
Western Wire Corporation, Boston, Mass.

WIRE—Steel—Also Coppered and Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Northwestern Steel & Wire Co., Sterling, Illinois
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Rylands Brothers, Limited, Warrington, England
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Stranded & Bunched
Laribee Wire, Inc., Camden, N. Y.

WIRE—Tinned
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.
Steel Heddle Mfg. Co., Philadelphia, Pa.

WIRE—Tire Bead
Suzuki Metal Industry Co., Ltd., Tokyo, Japan

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Buchanan, N. Y.

WRAPPING PAPER—Creped
(See PAPER-Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Chadwick Yarn Company, Pawtucket, R. I.
Synthetic Thread Co., Bethlehem, Pa.

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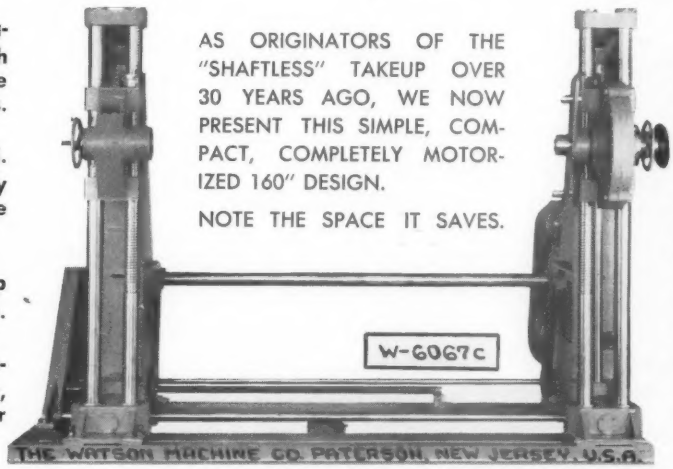

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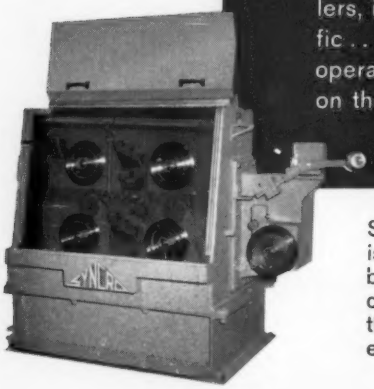

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